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FIG. 1
(RELATED ART)

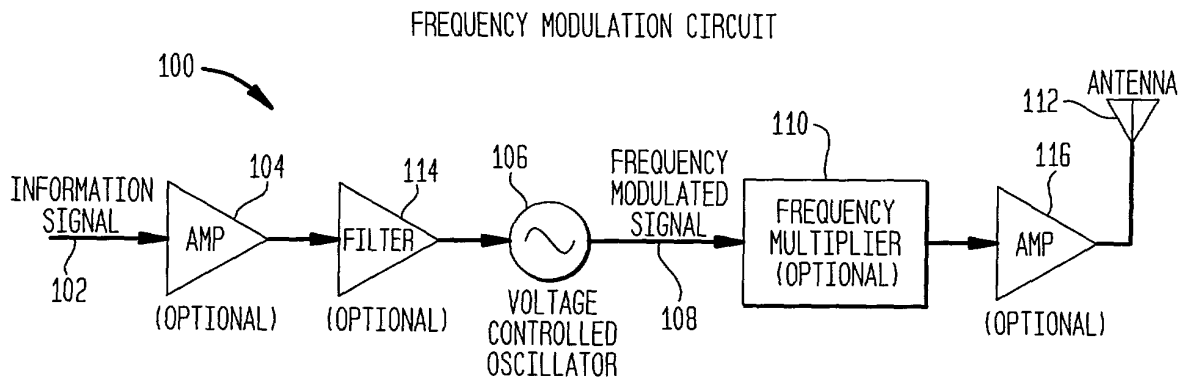


FIG. 2A
(RELATED ART)

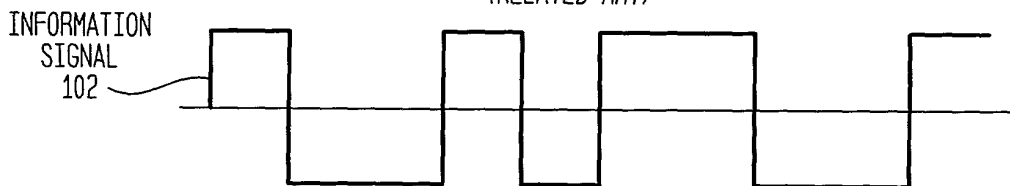


FIG. 2B
(RELATED ART)

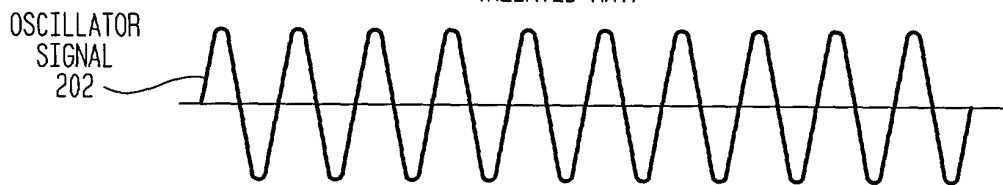
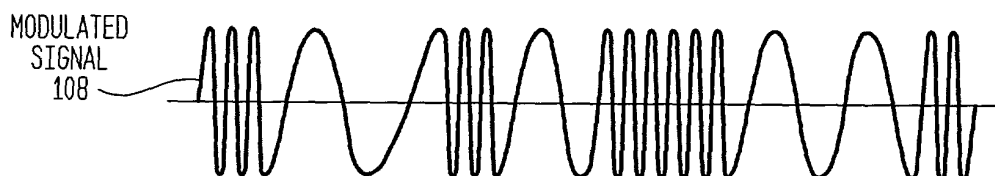


FIG. 2C
(RELATED ART)



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FIG. 3

(RELATED ART)

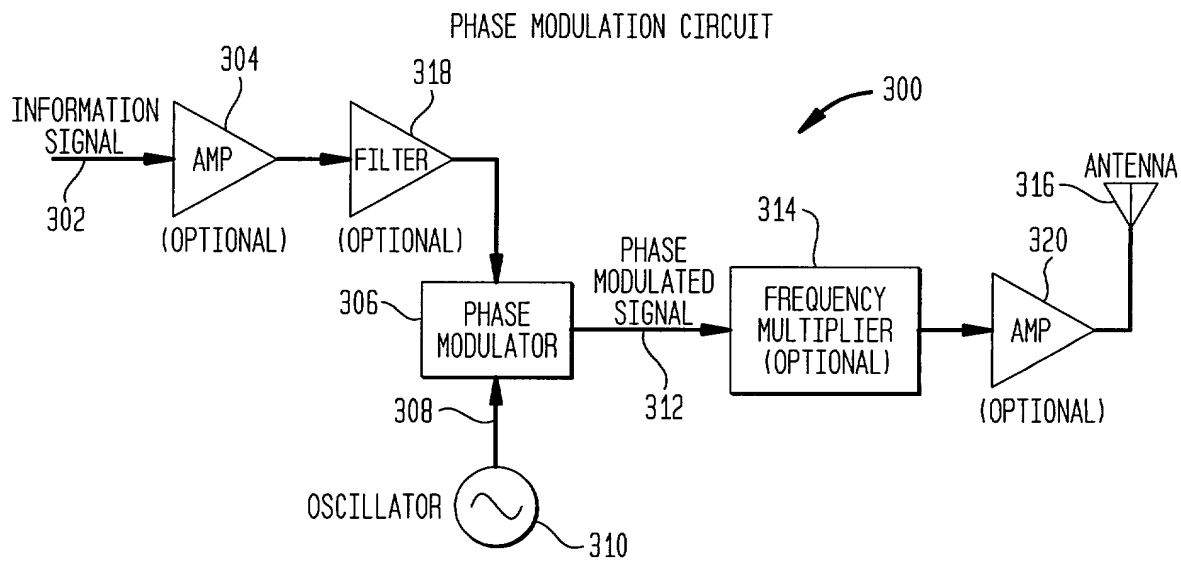


FIG. 4A

(RELATED ART)

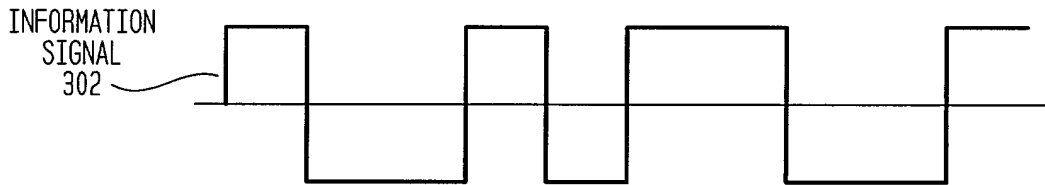


FIG. 4B

(RELATED ART)

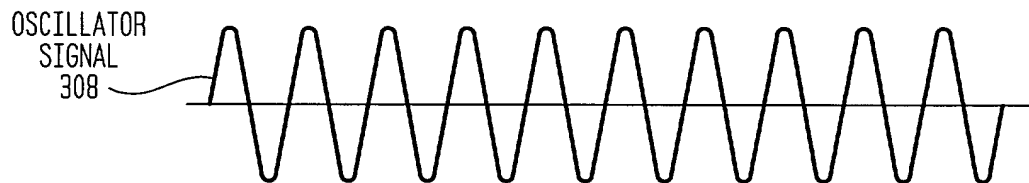
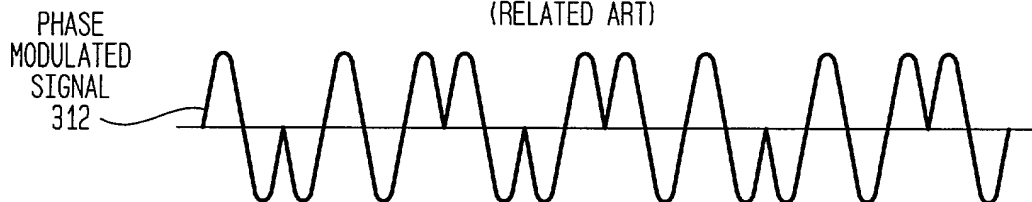


FIG. 4C

(RELATED ART)

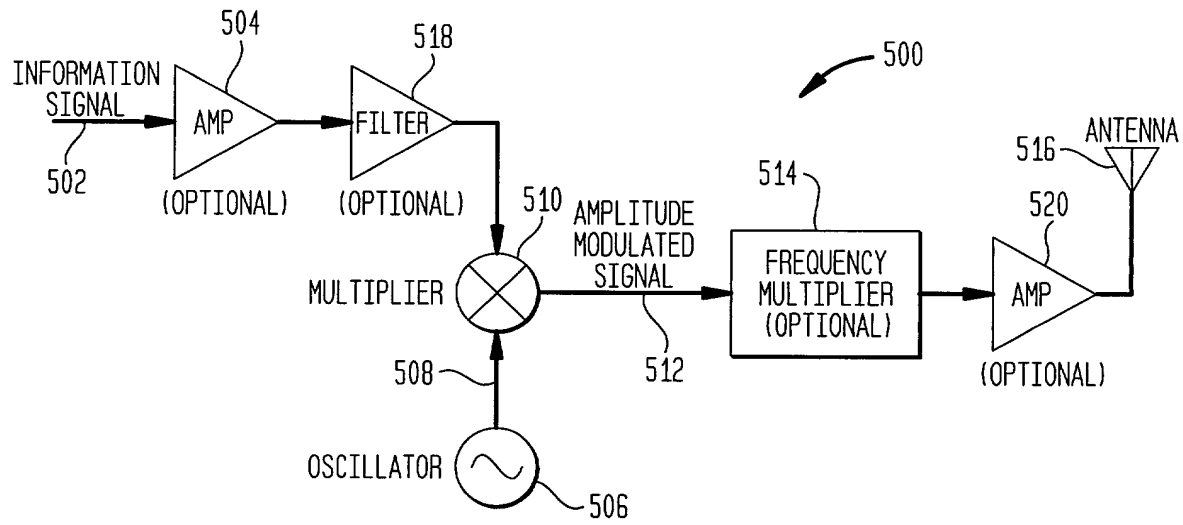


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FIG. 5
(RELATED ART)

AMPLITUDE MODULATION CIRCUIT



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FIG. 6A
(RELATED ART)

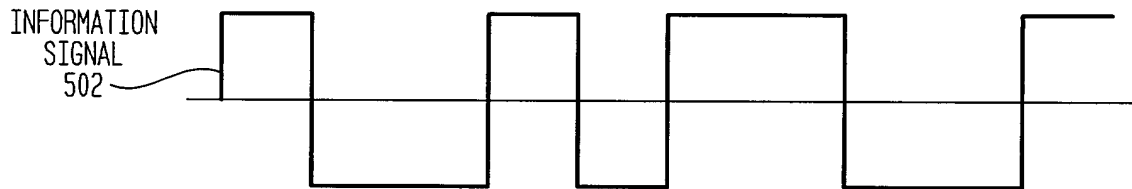


FIG. 6B
(RELATED ART)

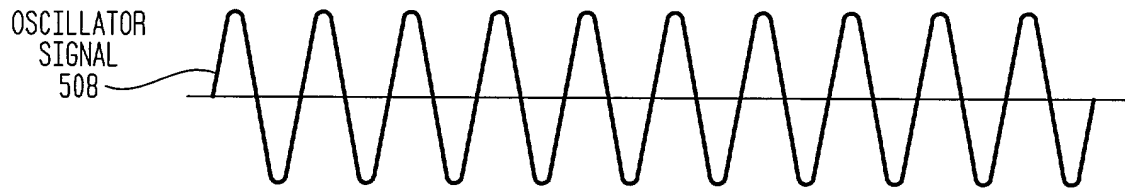
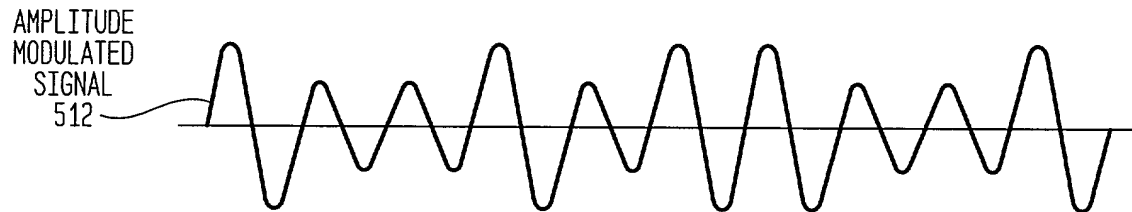


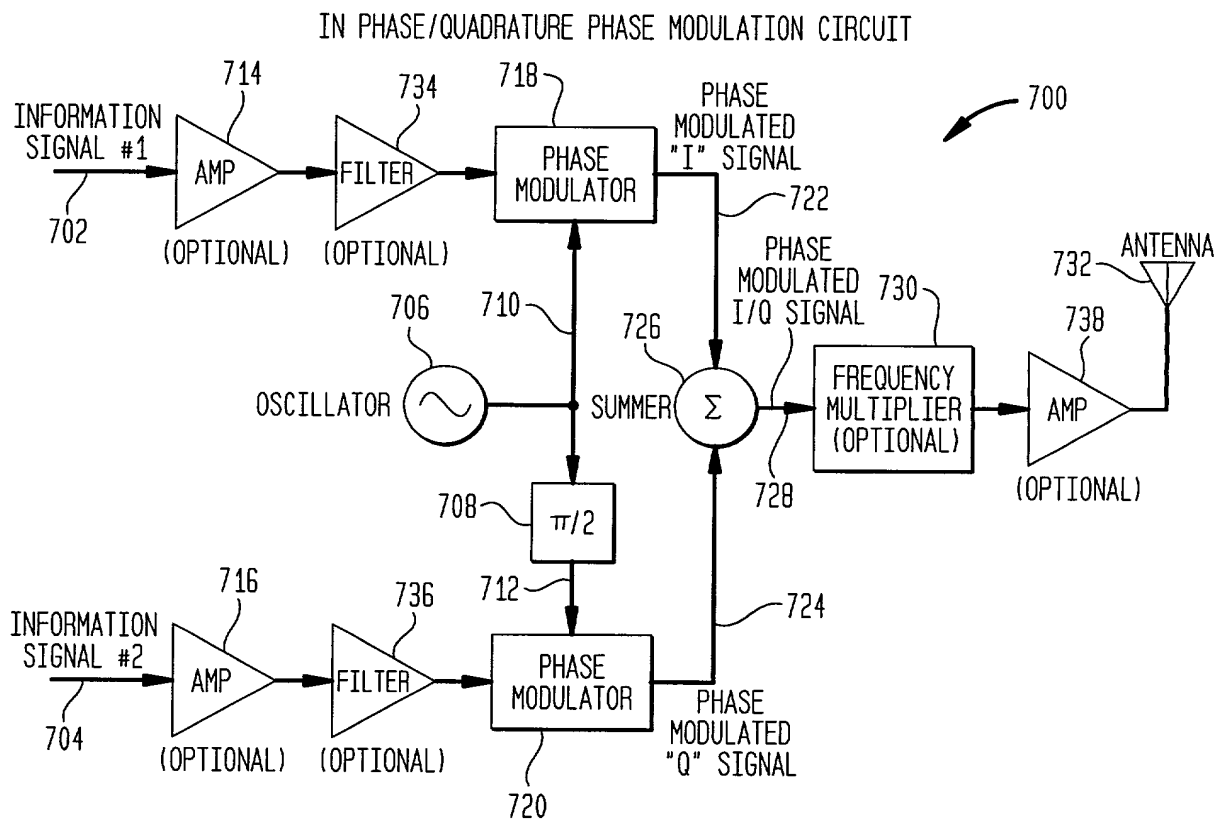
FIG. 6C
(RELATED ART)



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FIG. 7
(RELATED ART)



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FIG. 8A
(RELATED ART)

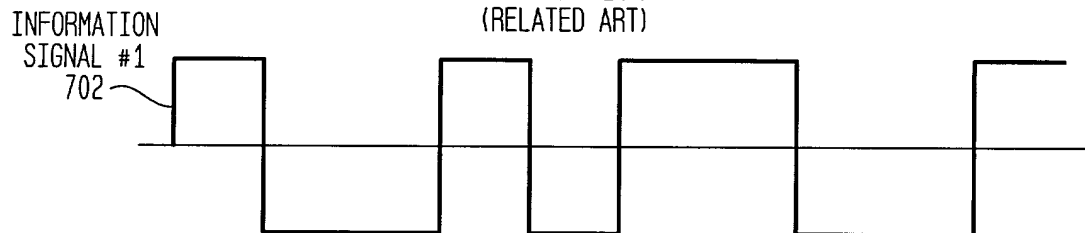


FIG. 8B
(RELATED ART)

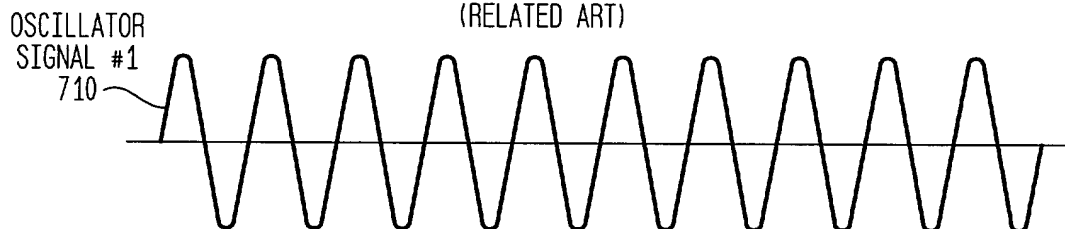


FIG. 8C
(RELATED ART)

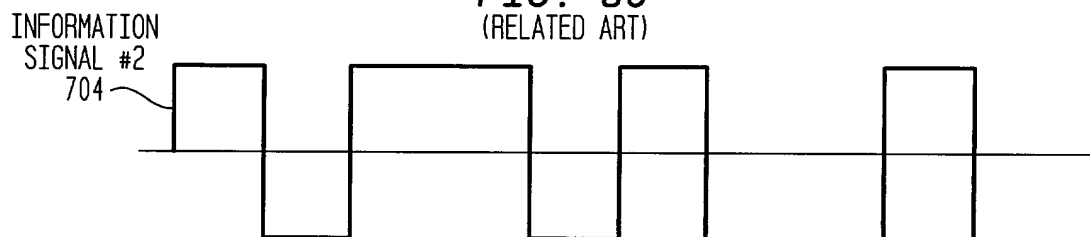


FIG. 8D
(RELATED ART)

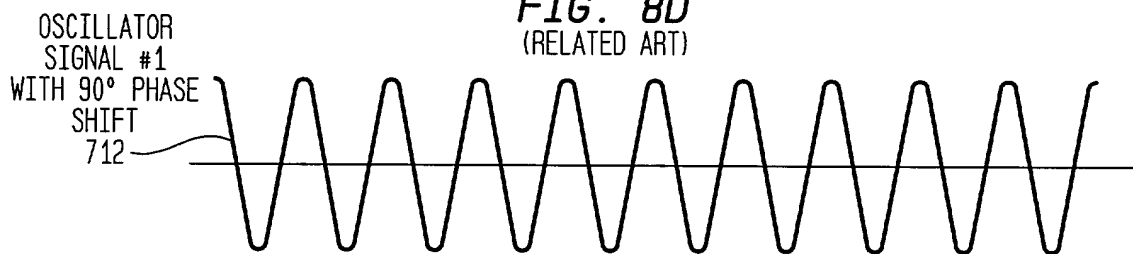
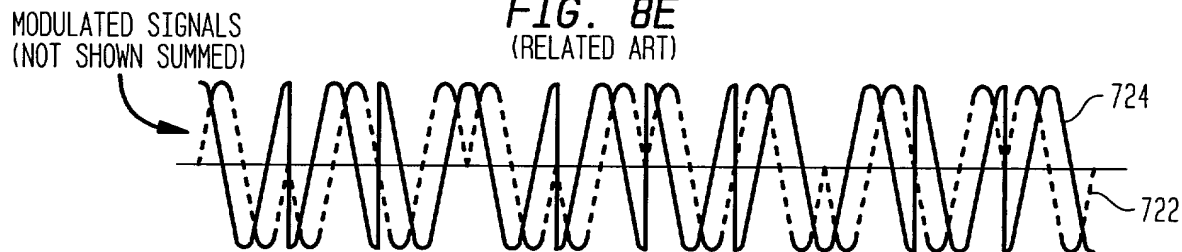


FIG. 8E
(RELATED ART)



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FIG. 9

TRANSMITTER

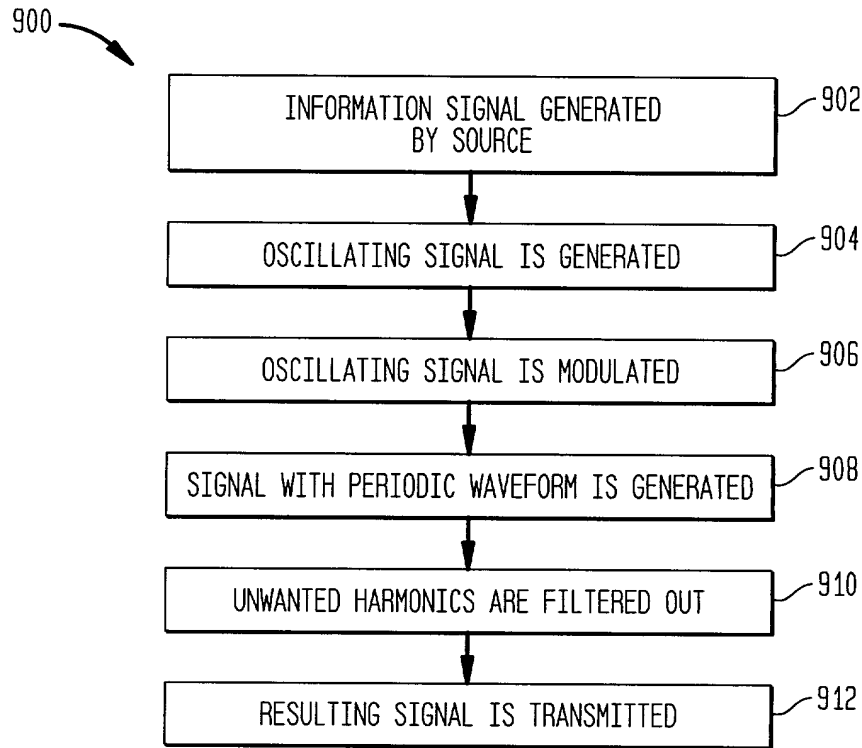
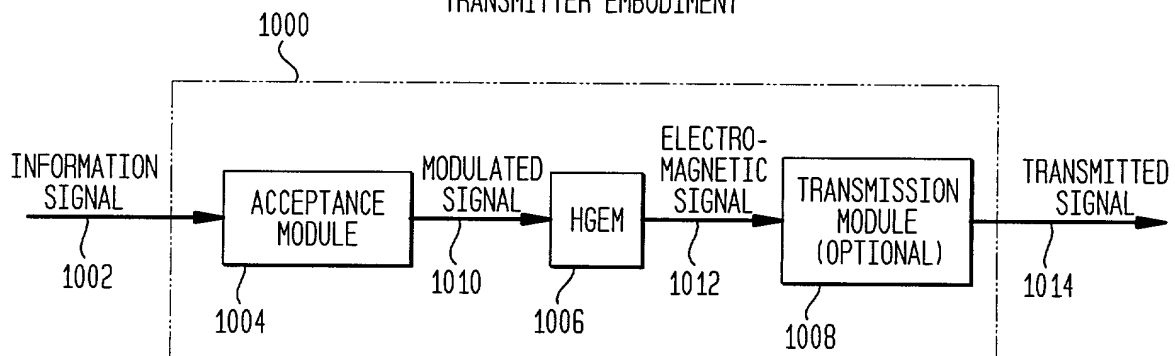


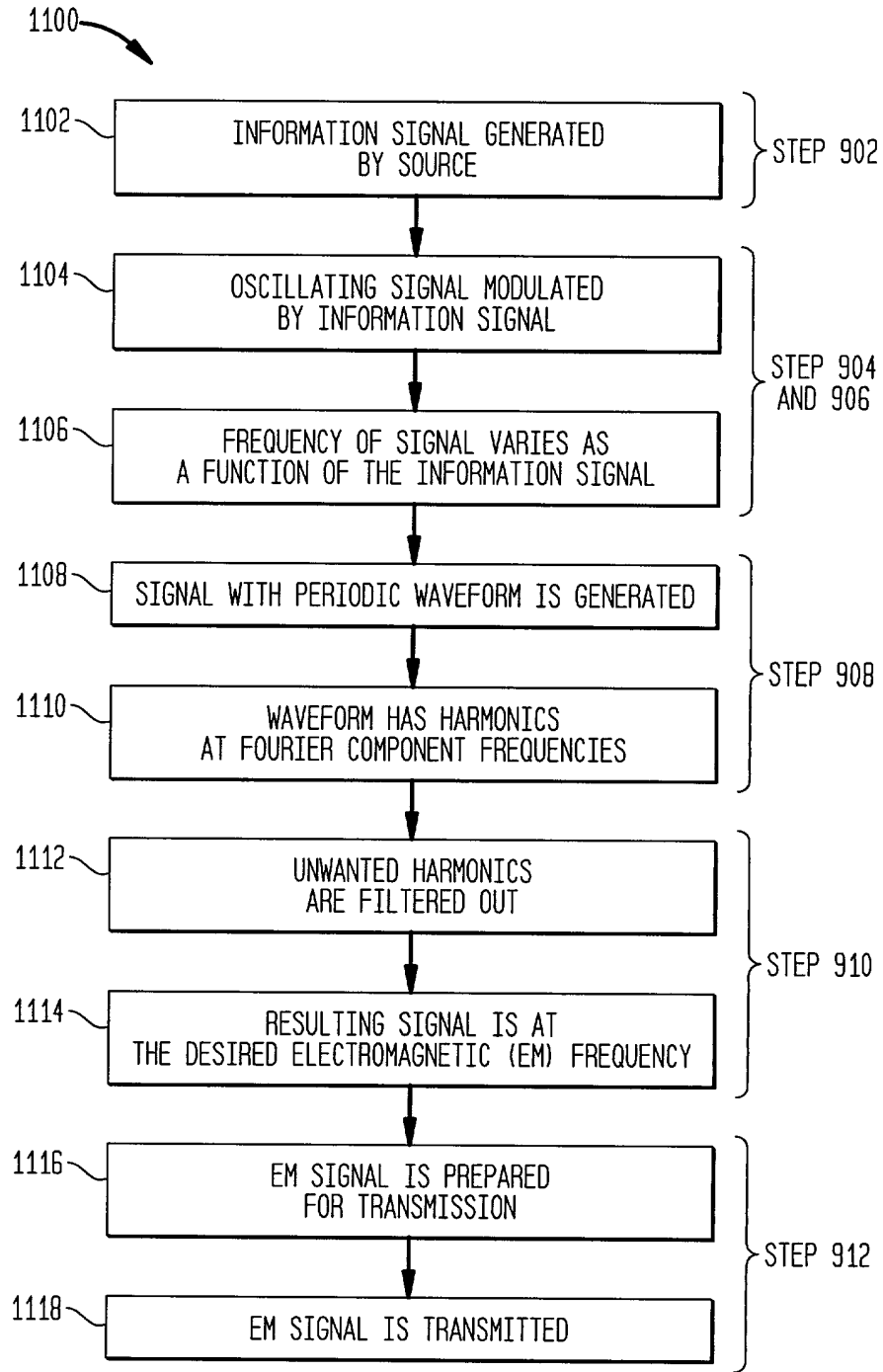
FIG. 10

TRANSMITTER EMBODIMENT



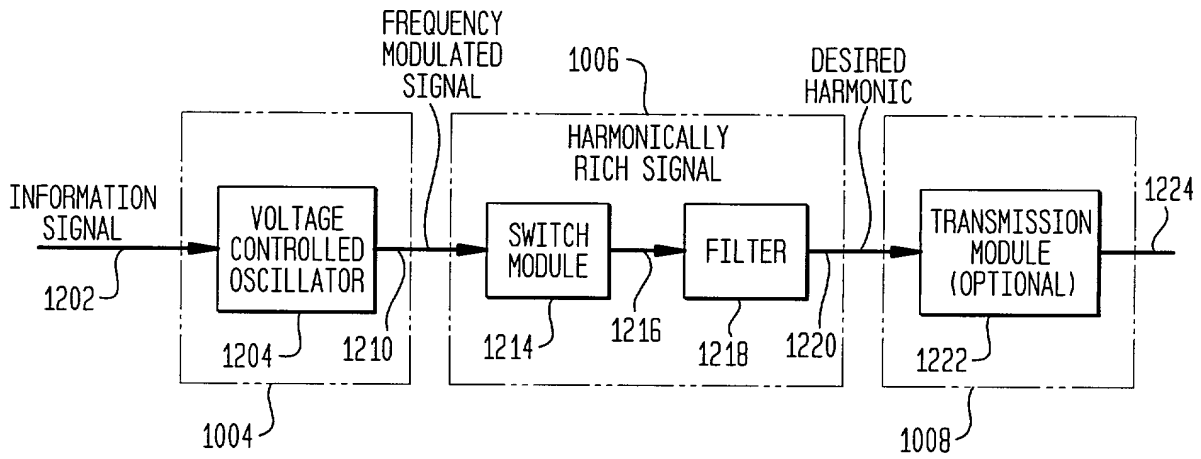
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FIG. 11
FREQUENCY MODULATION MODE



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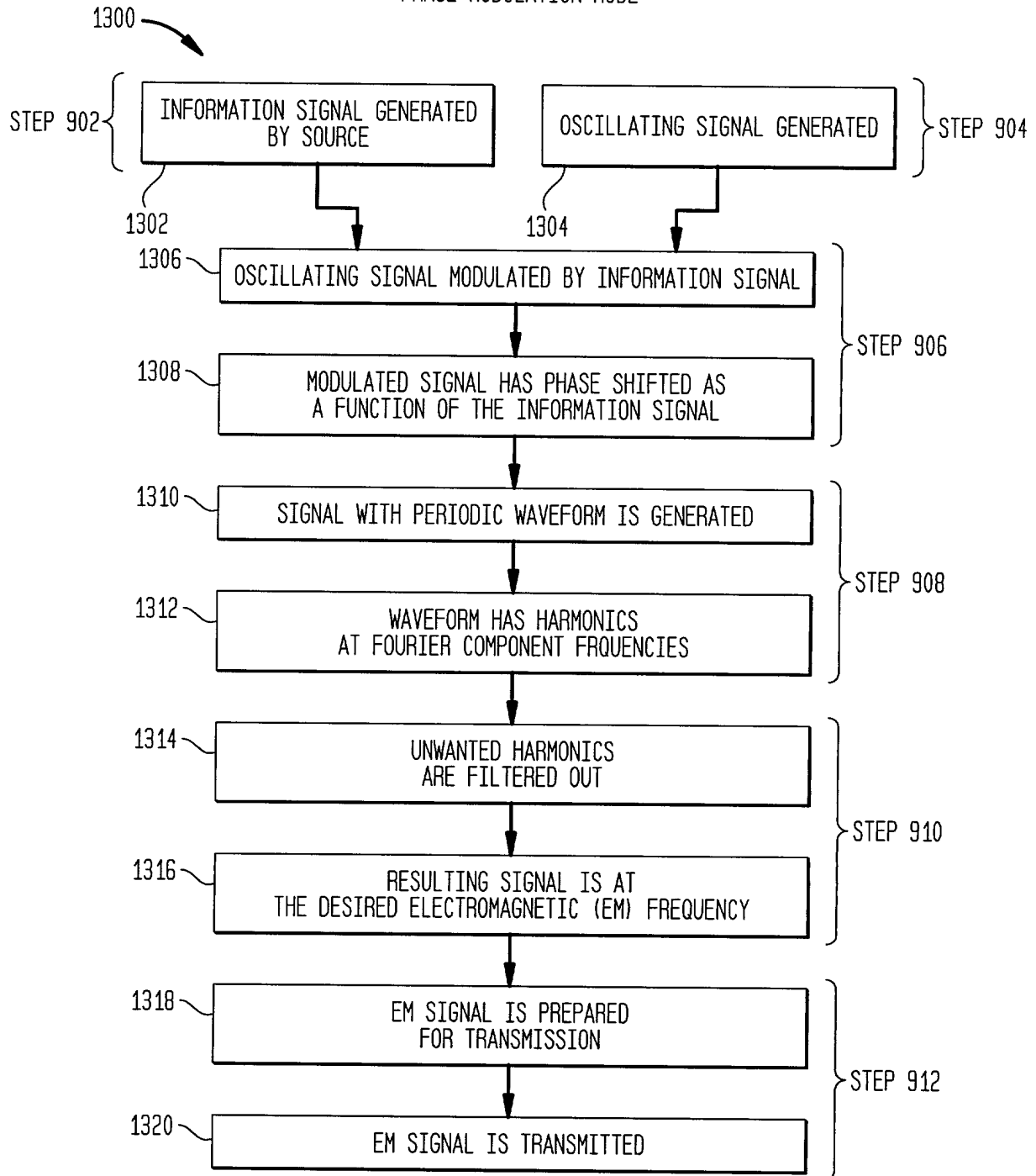
FIG. 12



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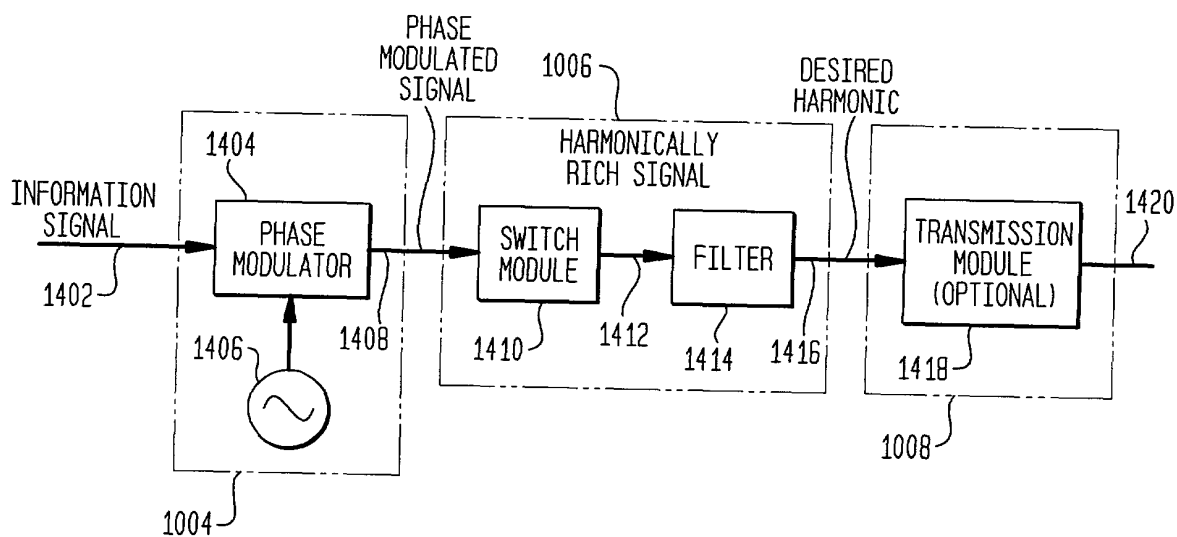
FIG. 13

PHASE MODULATION MODE



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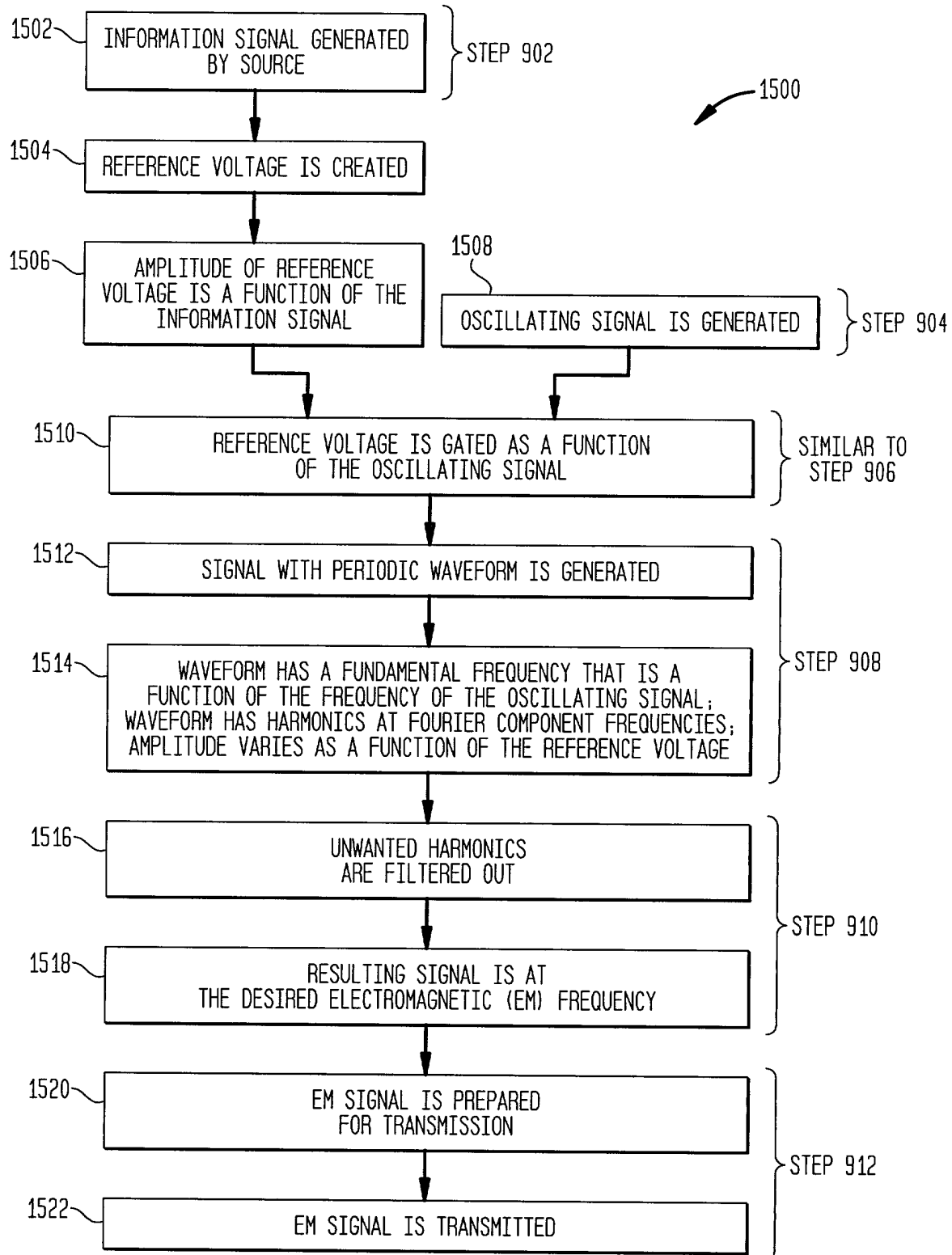
FIG. 14



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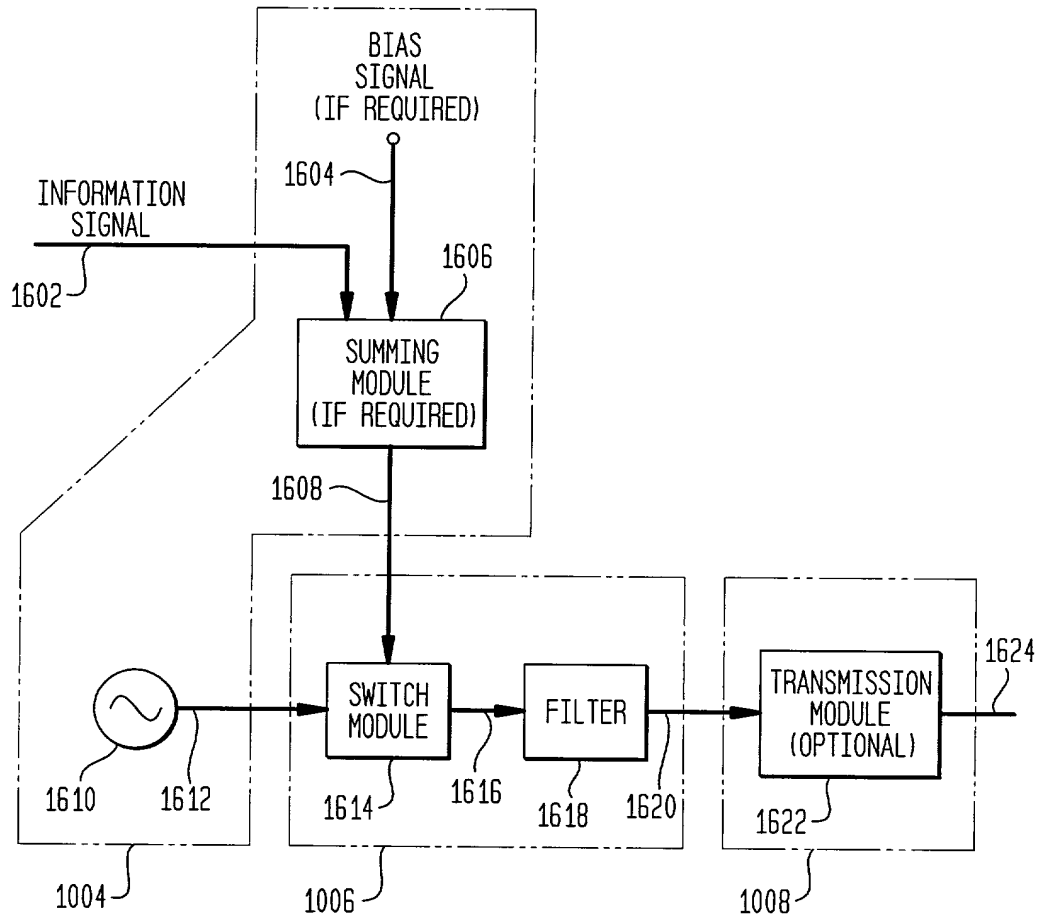
FIG. 15

AMPLITUDE MODULATION MODE



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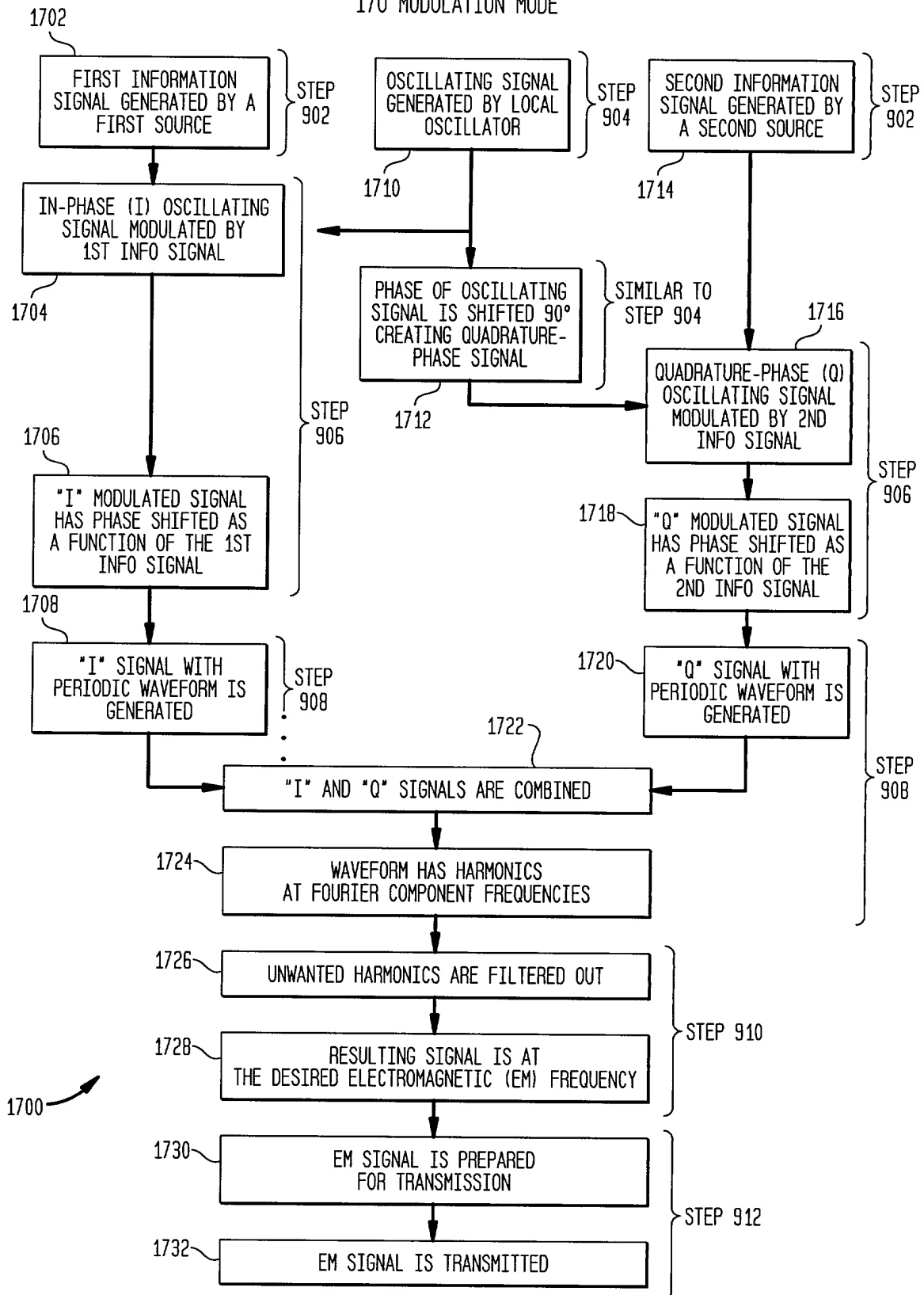
FIG. 16



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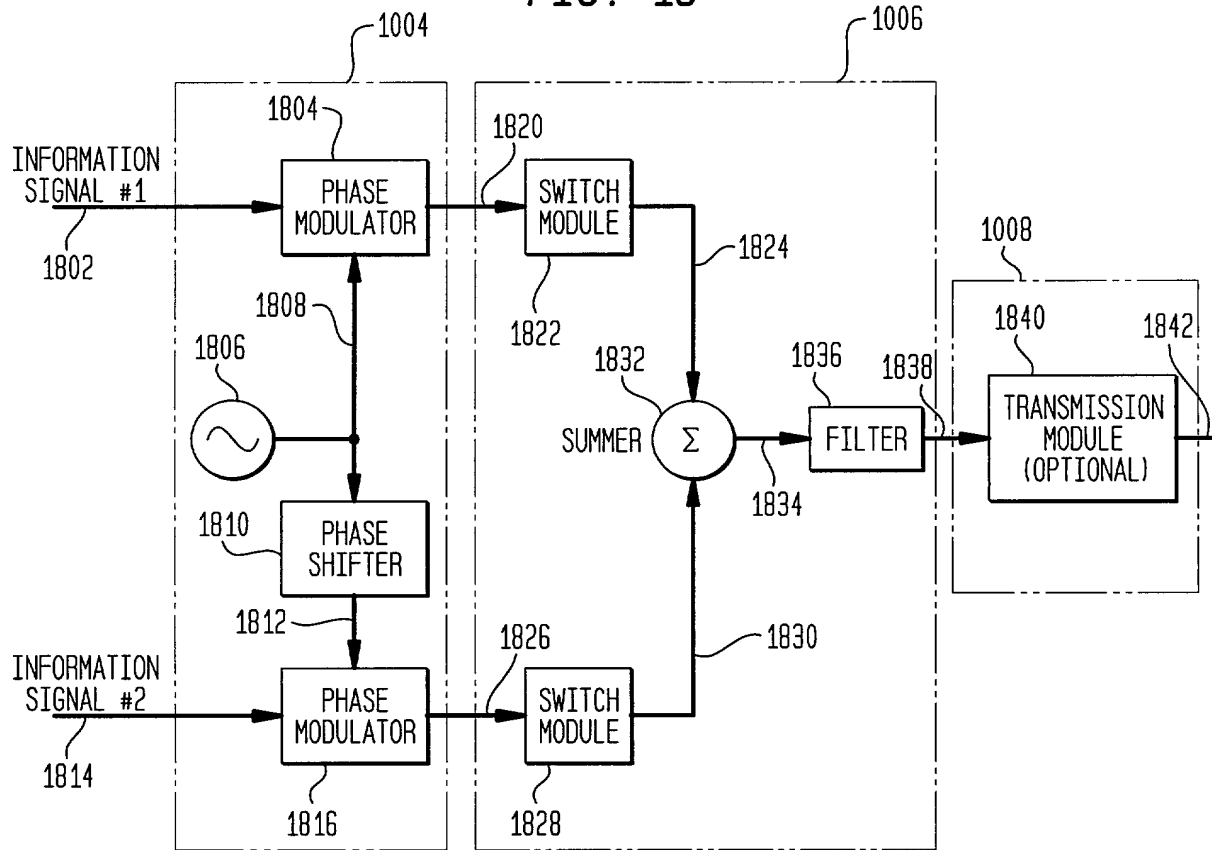
FIG. 17

I/O MODULATION MODE



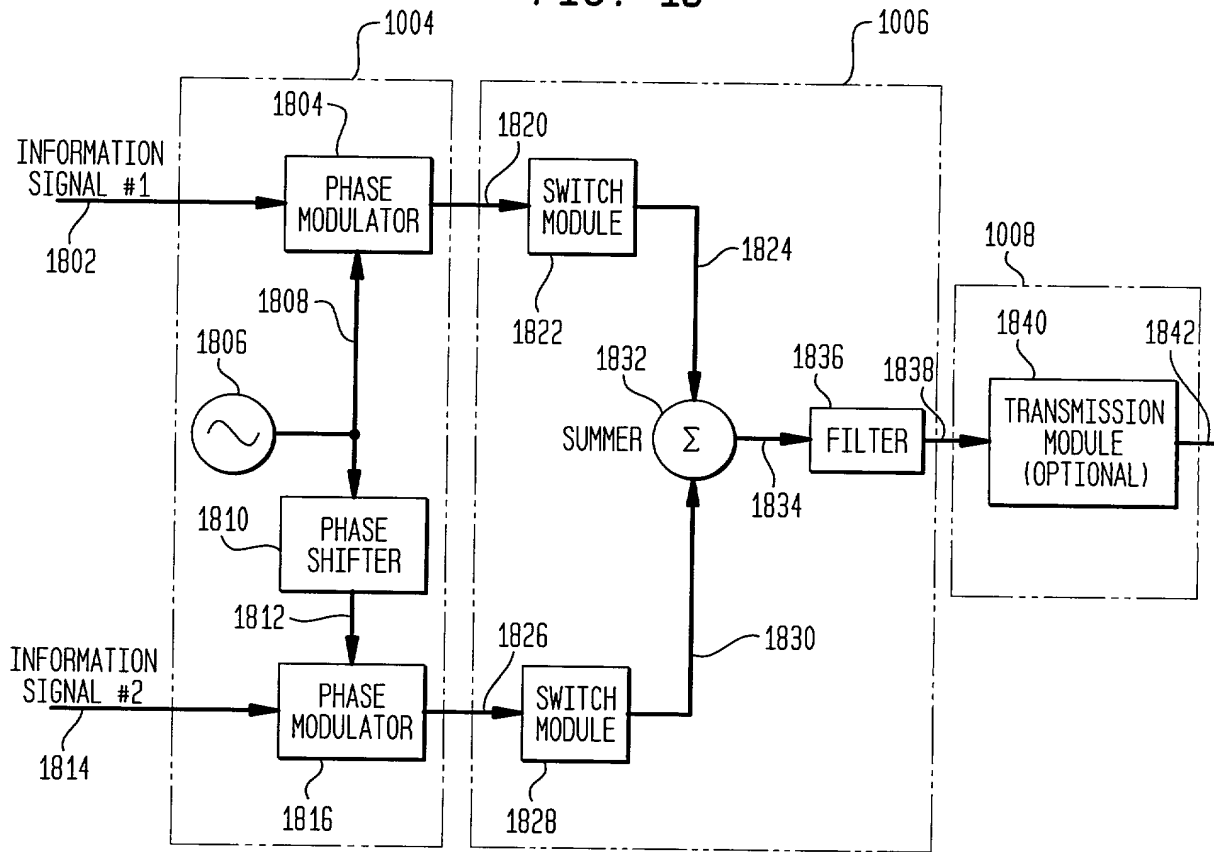
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FIG. 18



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FIG. 18



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FIG. 19A

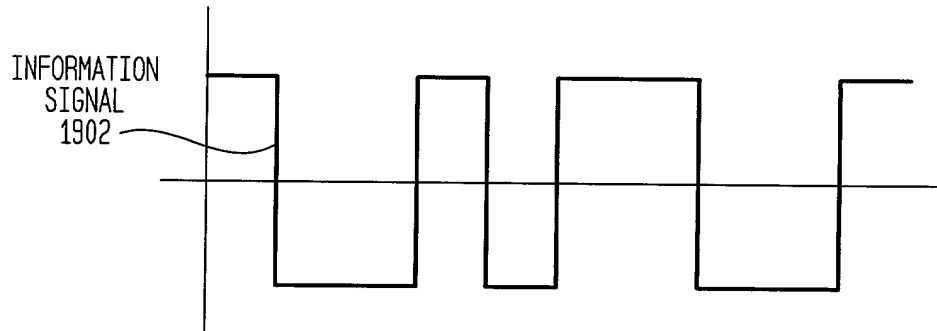


FIG. 19B

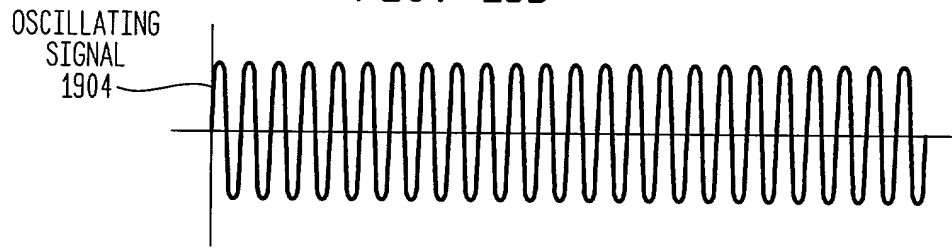


FIG. 19C

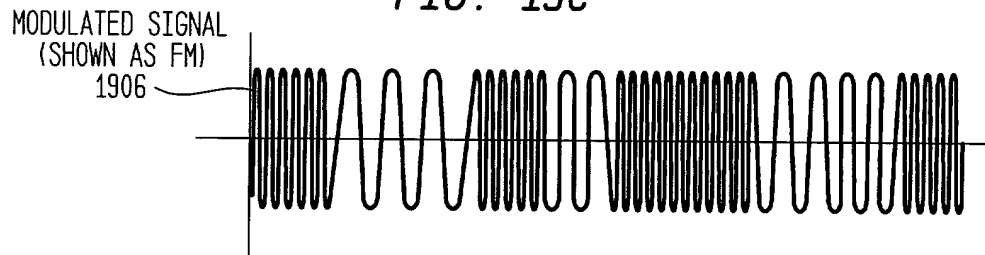
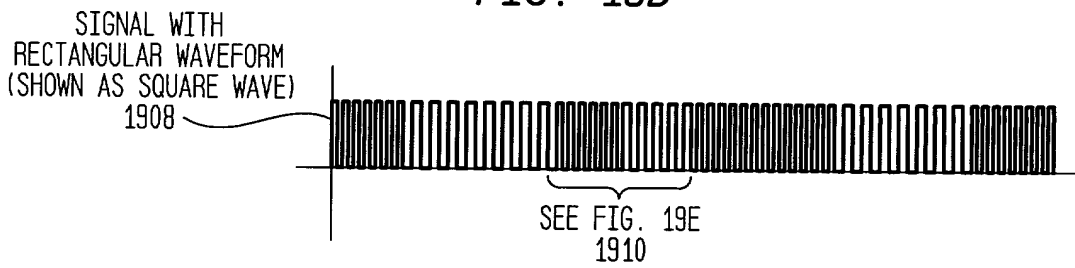
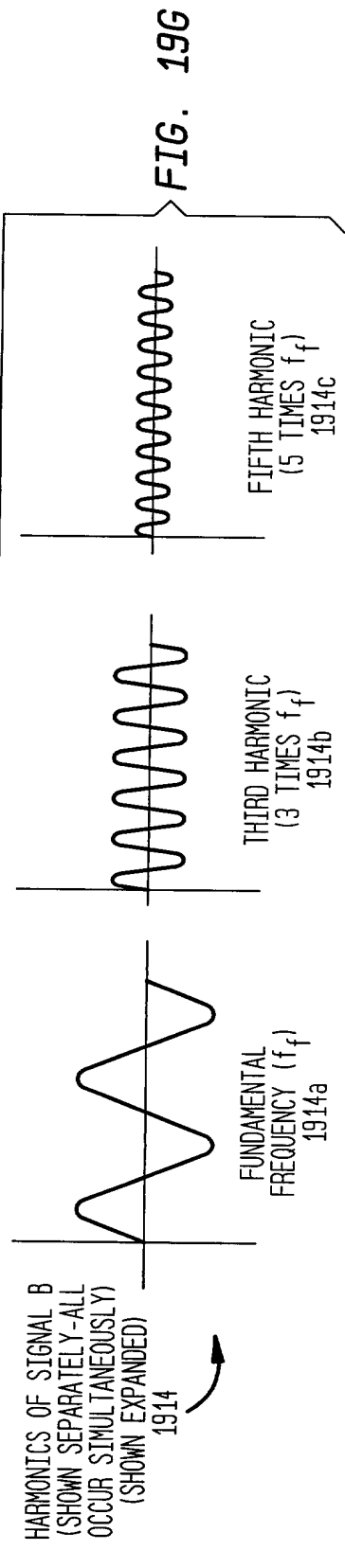
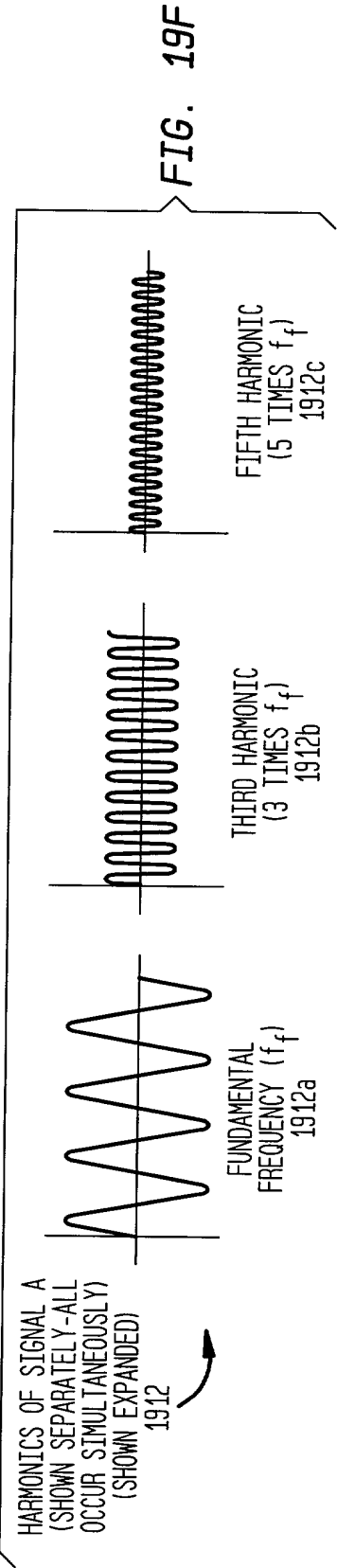


FIG. 19D



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FIG. 19E



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FIG. 19H

HARMONICS OF
SIGNAL A & B
(SHOWN SIMULTANEOUSLY
BUT NOT SUMMED)
(SHOWN EXPANDED)
1916

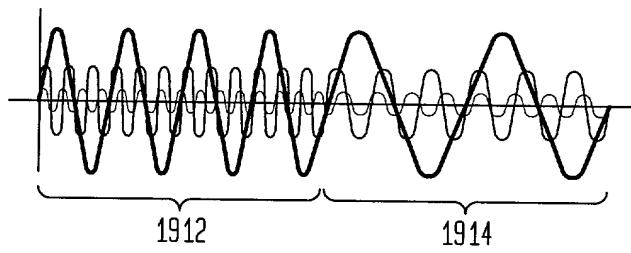
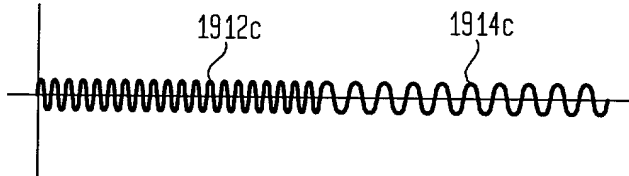


FIG. 19I

FILTERED
SIGNAL A & B
(SHOWN EXPANDED)
1918



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FIG. 20A
(RELATED ART)

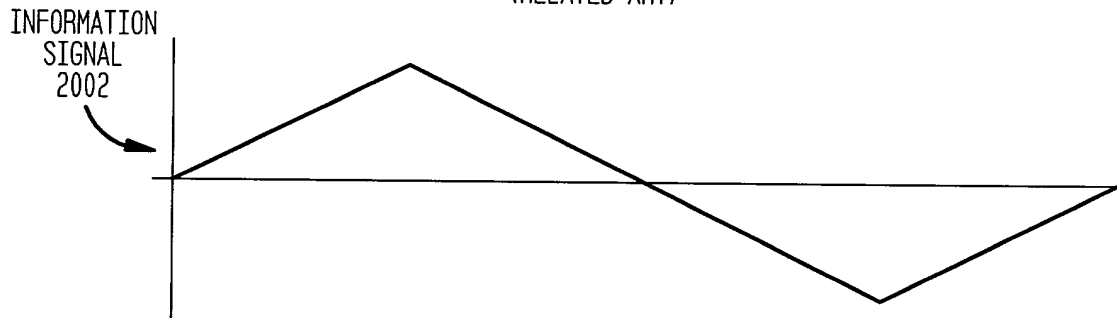


FIG. 20B
(RELATED ART)

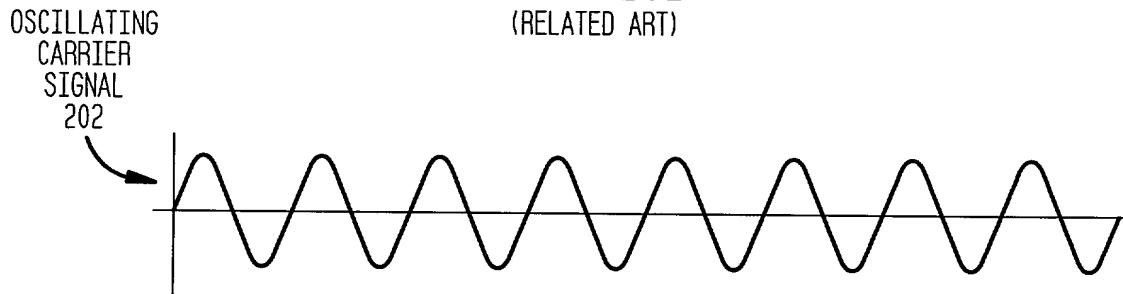
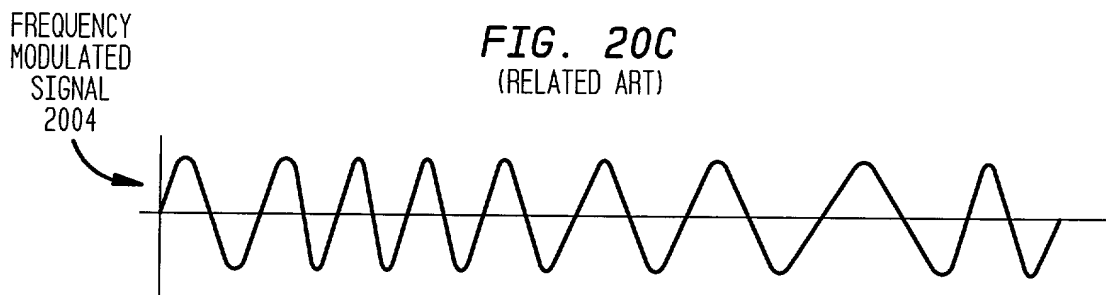


FIG. 20C
(RELATED ART)



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FIG. 21A
(RELATED ART)

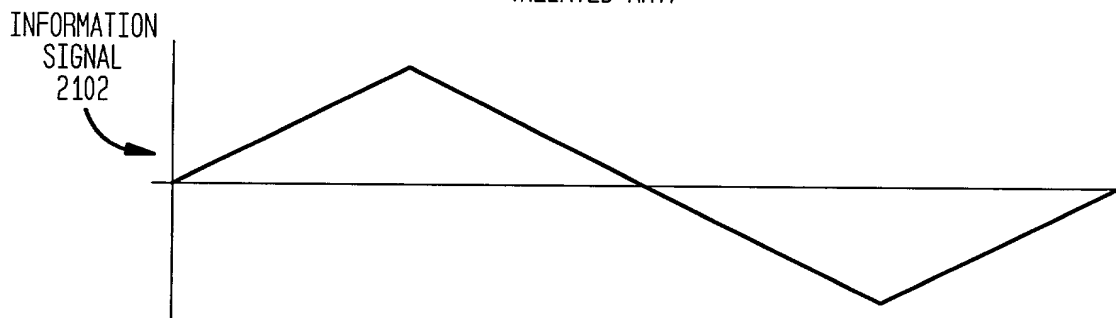


FIG. 21B
(RELATED ART)

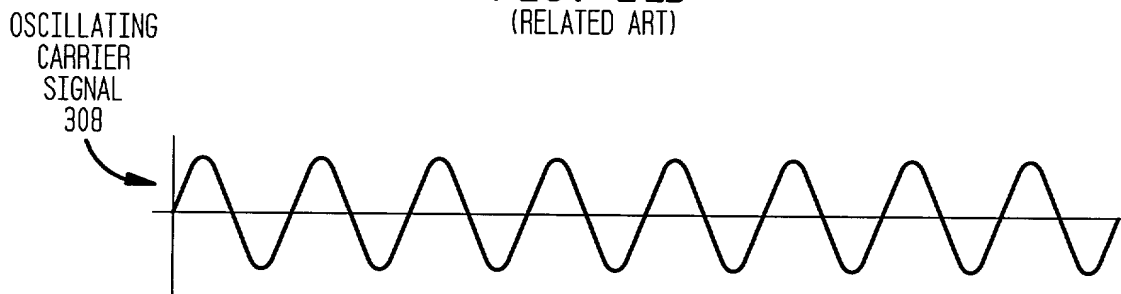
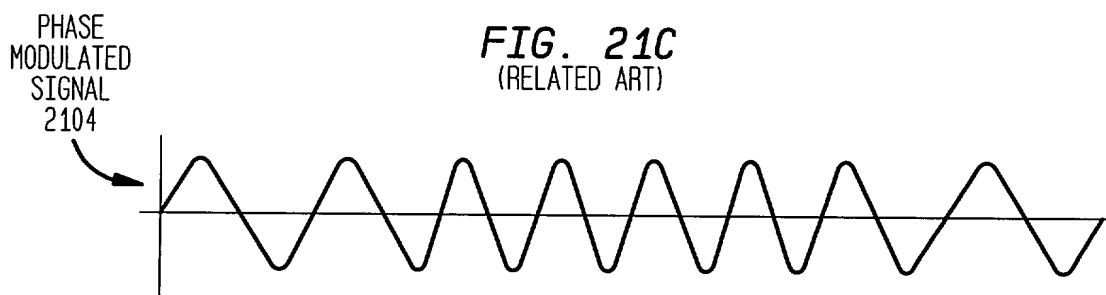


FIG. 21C
(RELATED ART)



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FIG. 22A
(RELATED ART)

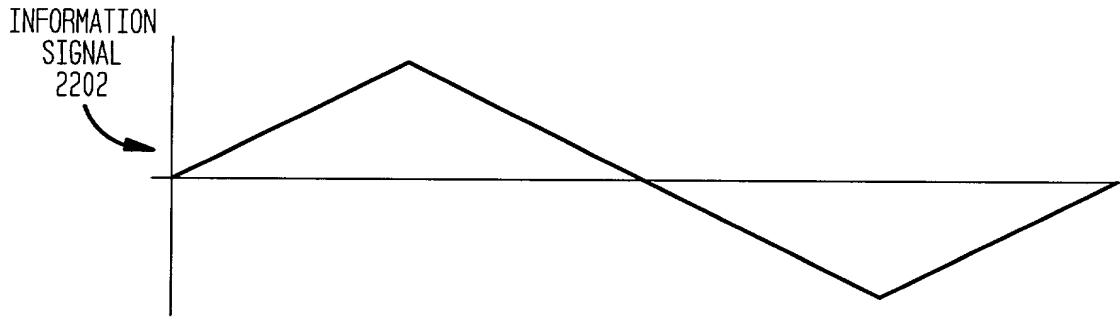


FIG. 22B
(RELATED ART)

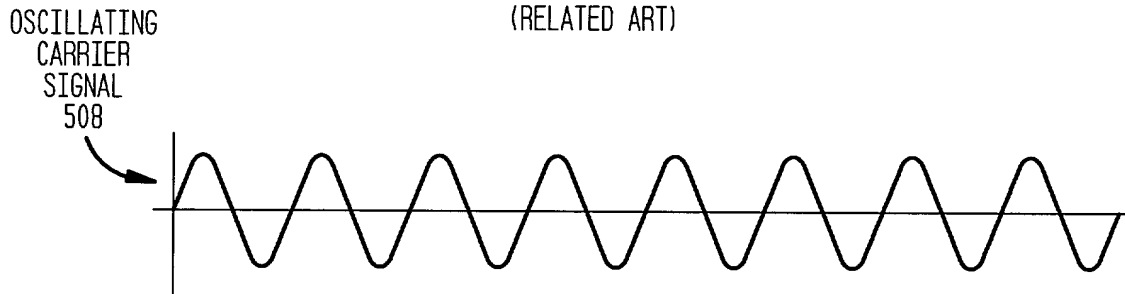


FIG. 22C
(RELATED ART)

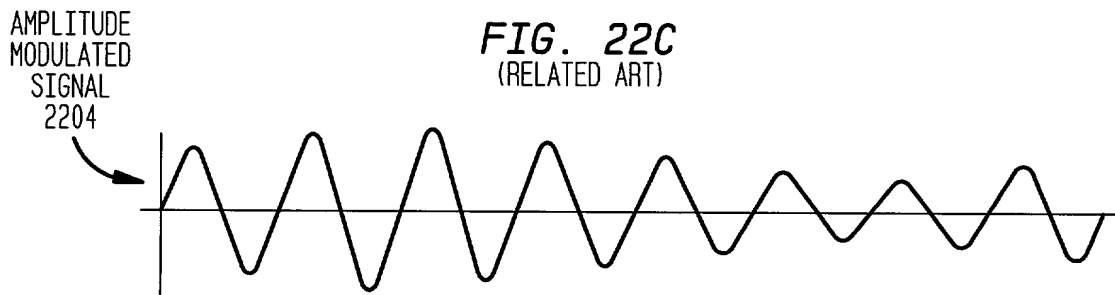
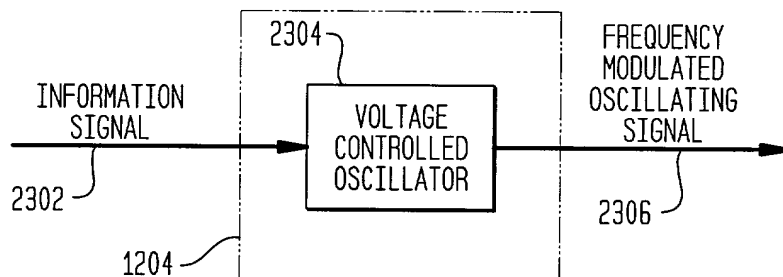


FIG. 23



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FIG. 24

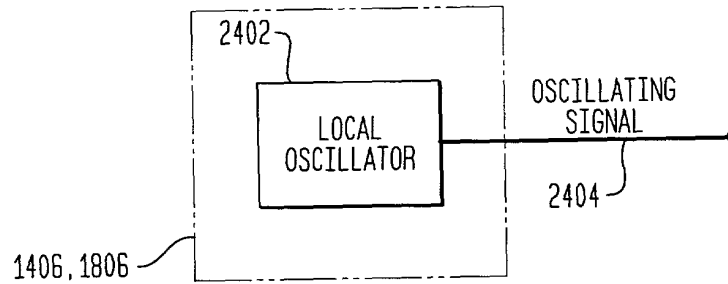


FIG. 25

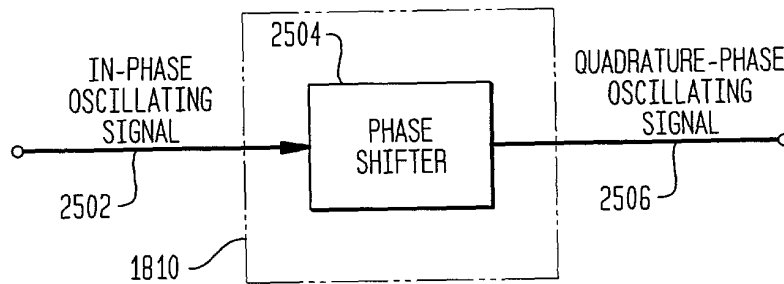


FIG. 26

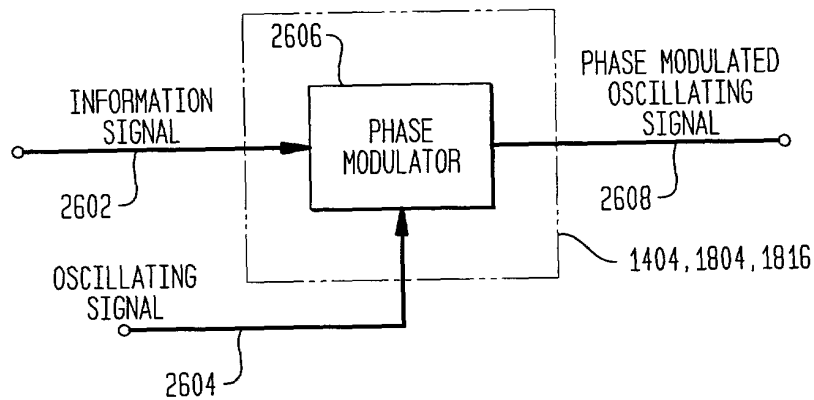
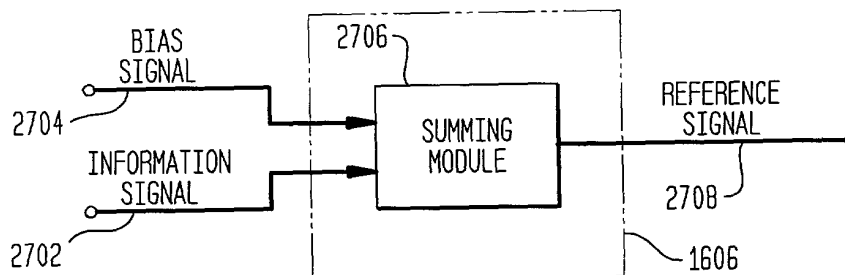


FIG. 27



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FIG. 28A

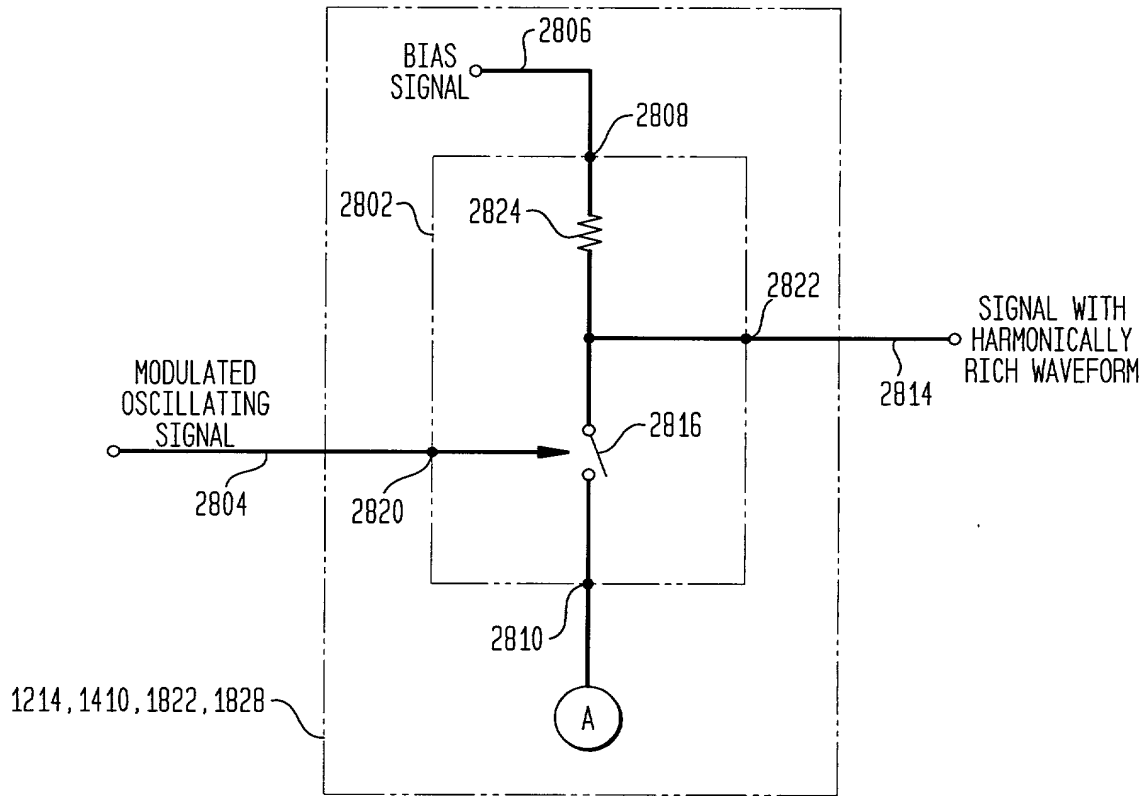


FIG. 28B

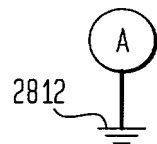
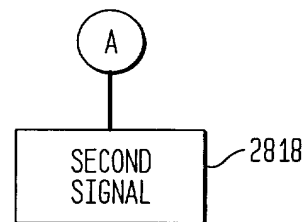


FIG. 28C



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FIG. 29A

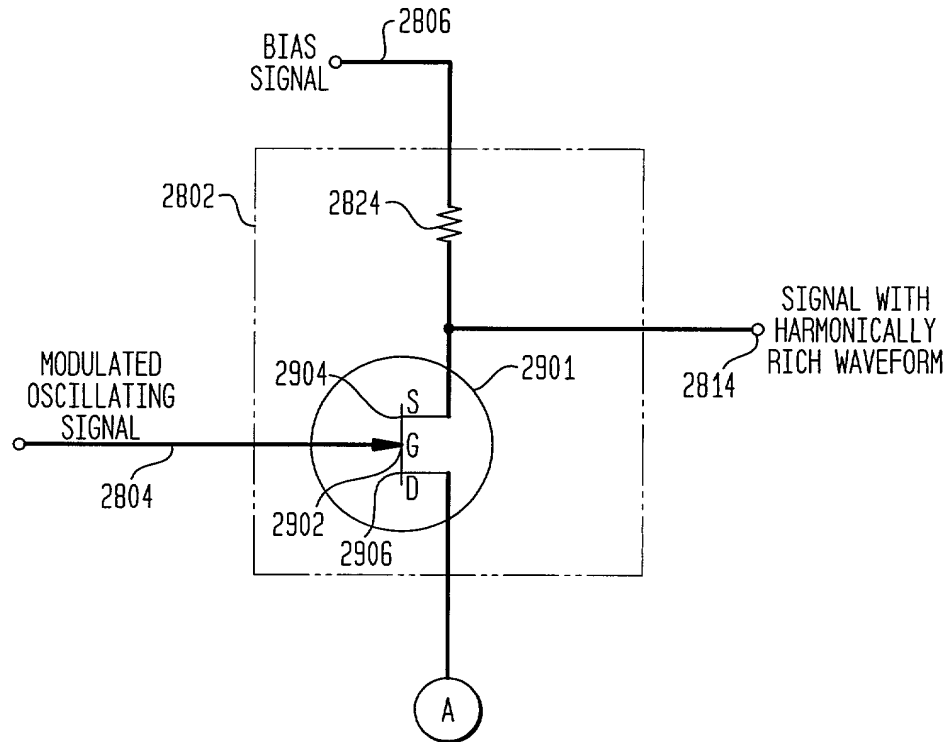


FIG. 29B

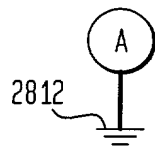
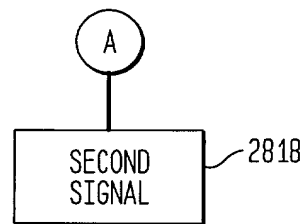


FIG. 29C



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FIG. 30A

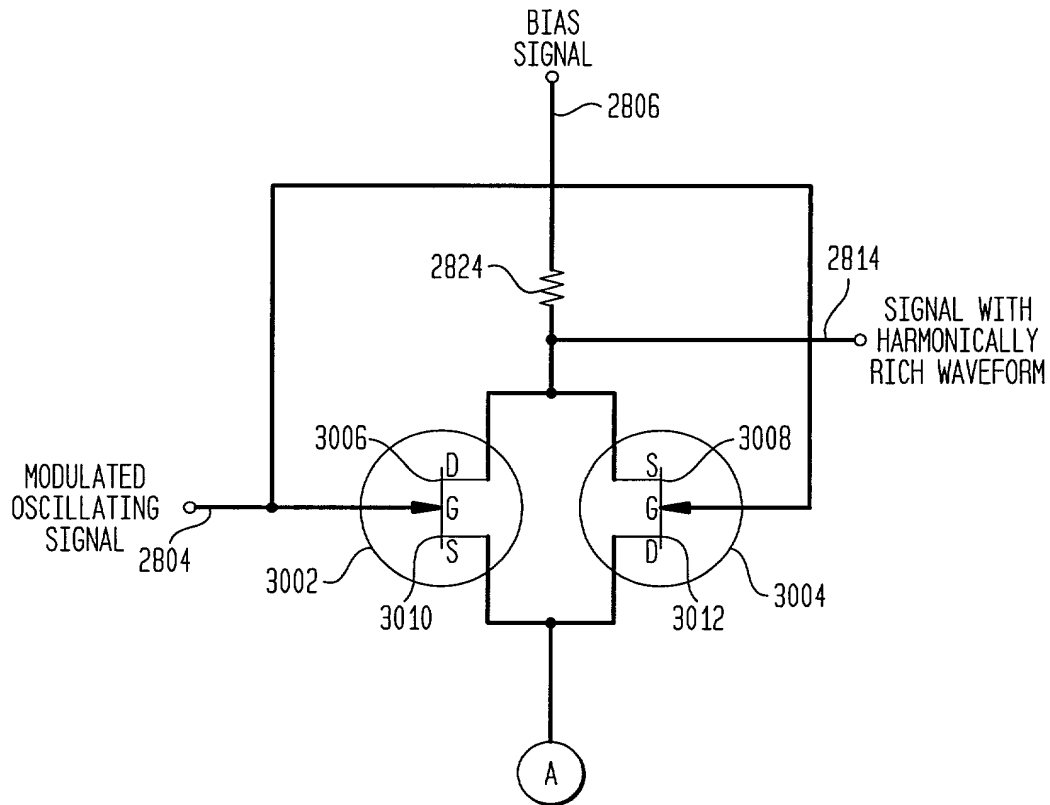


FIG. 30B

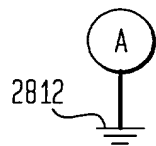
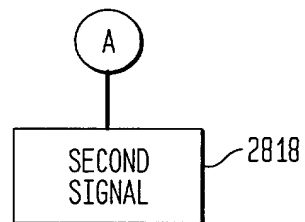


FIG. 30C



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FIG. 31A

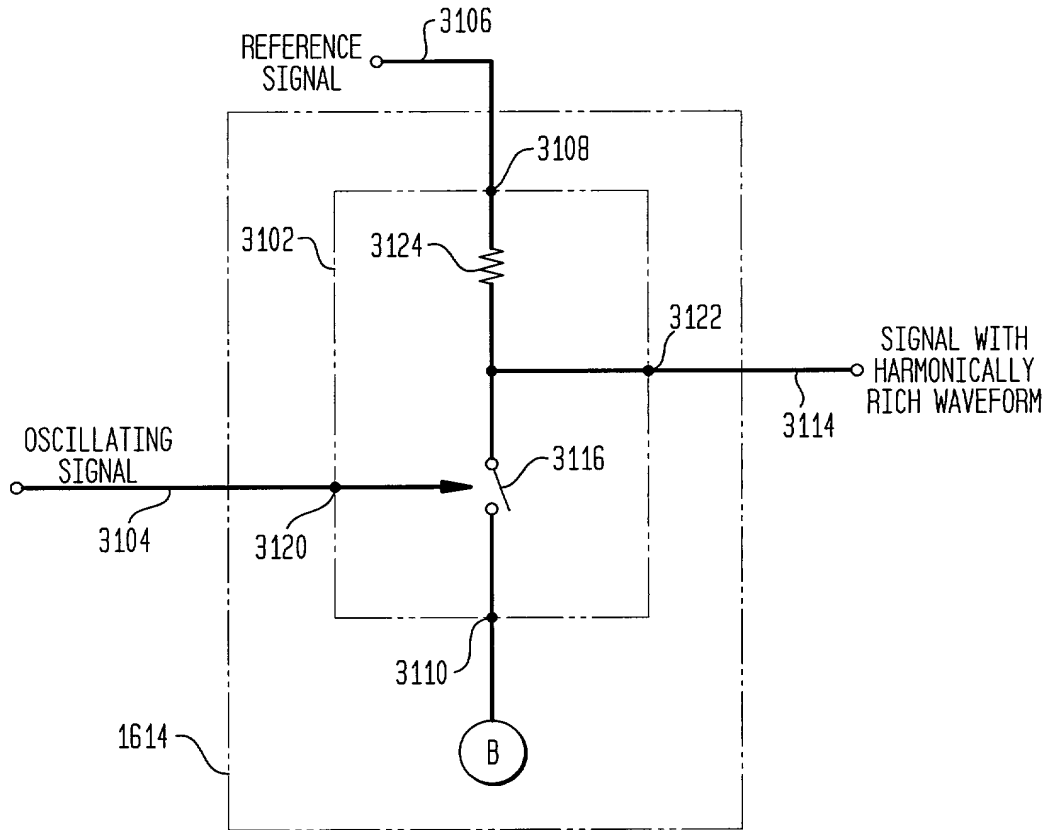


FIG. 31B

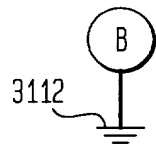
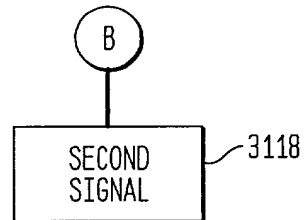


FIG. 31C



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FIG. 32A

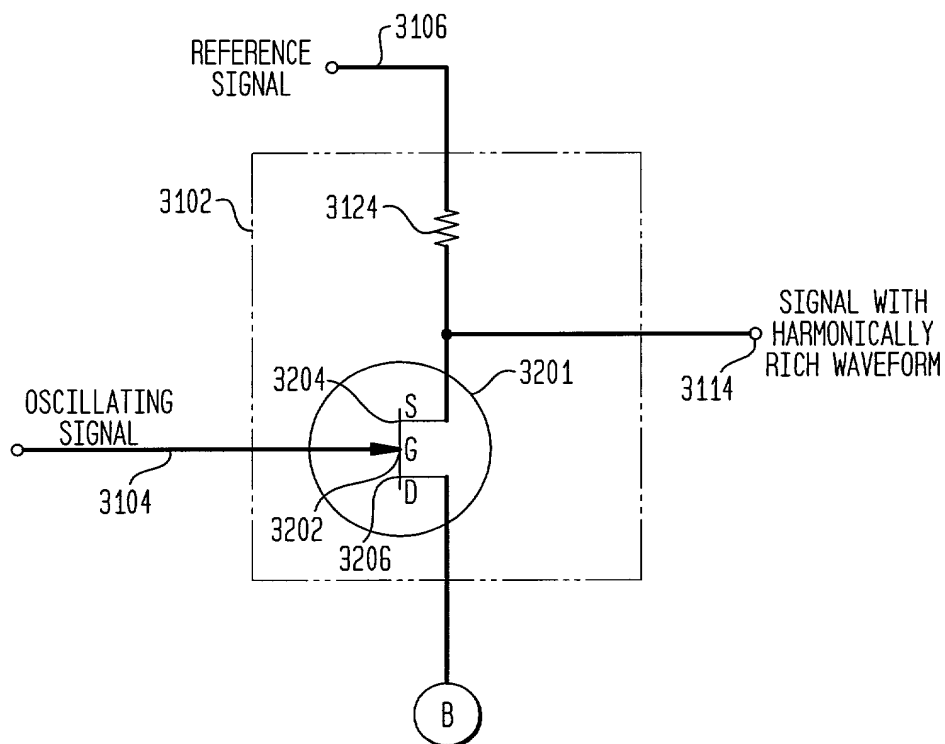


FIG. 32B

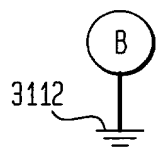


FIG. 32C

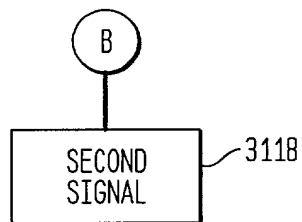


FIG. 33A

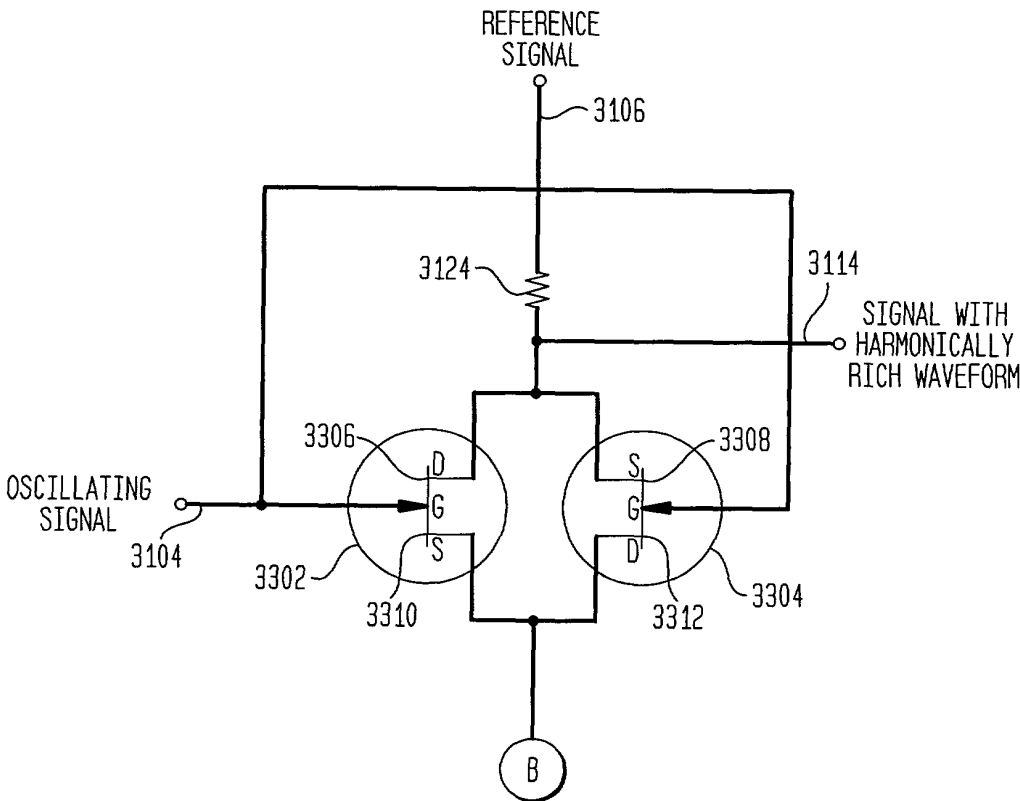


FIG. 33B

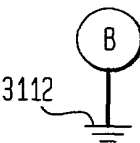
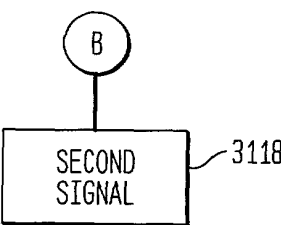


FIG. 33C



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FIG. 34

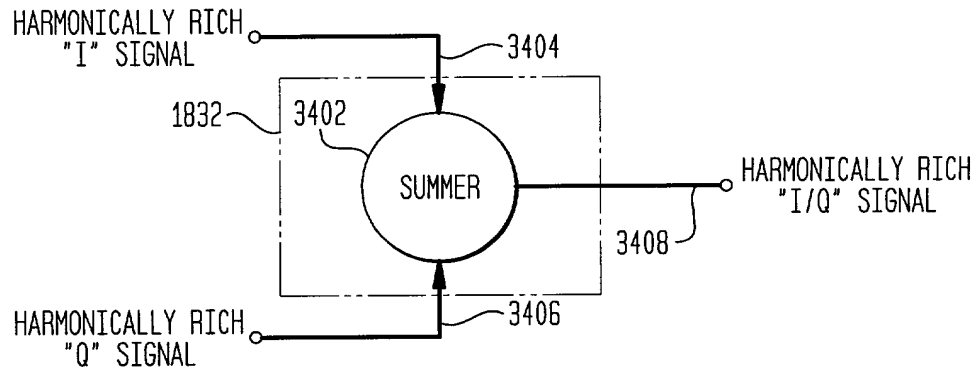


FIG. 35

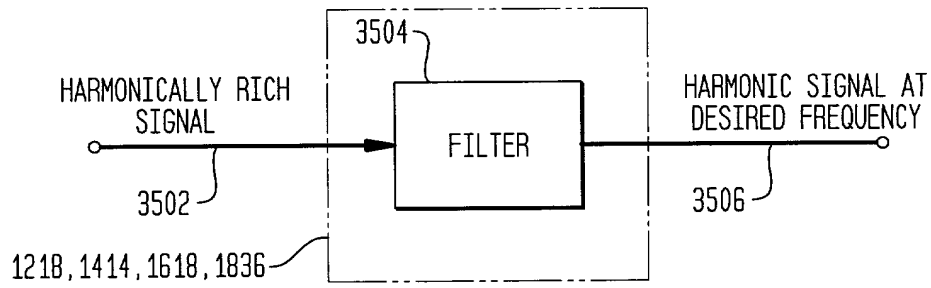
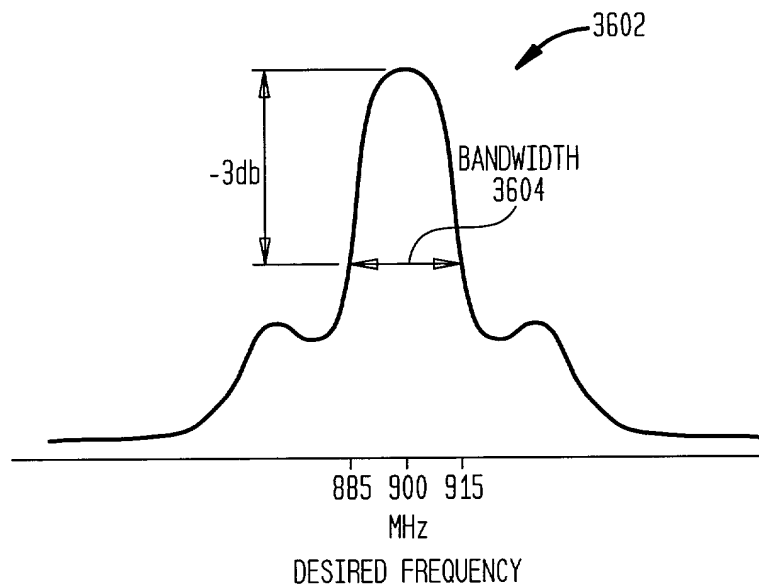


FIG. 36



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FIG. 37A

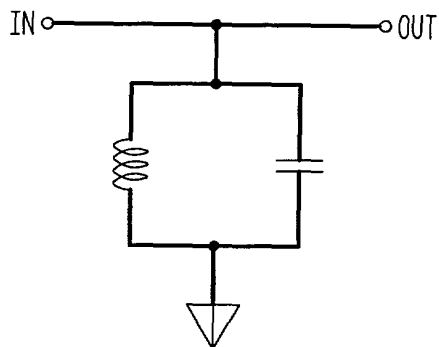


FIG. 37B

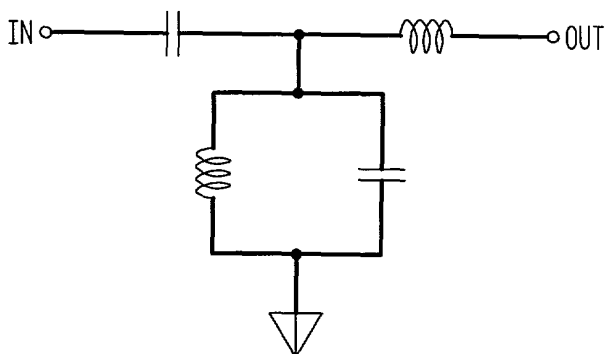
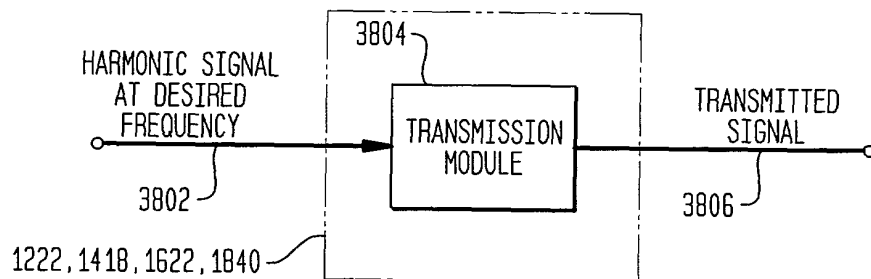


FIG. 38



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FIG. 39A

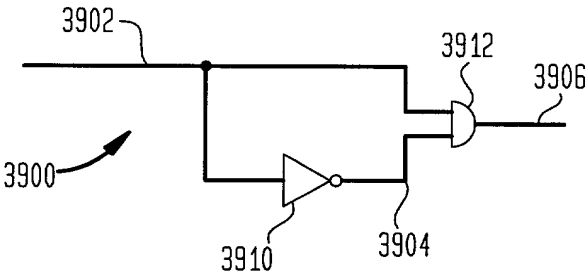


FIG. 39B

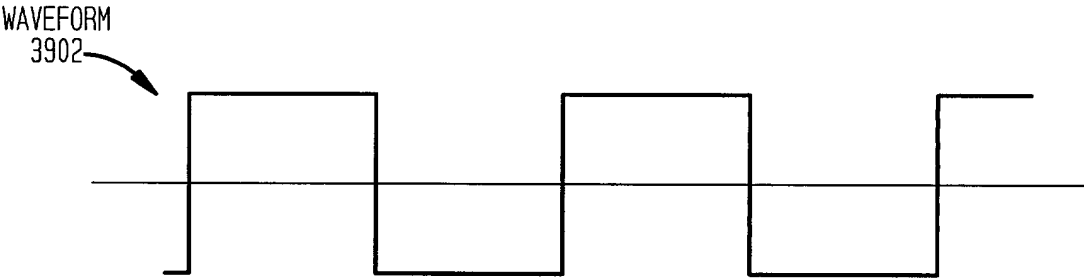


FIG. 39C

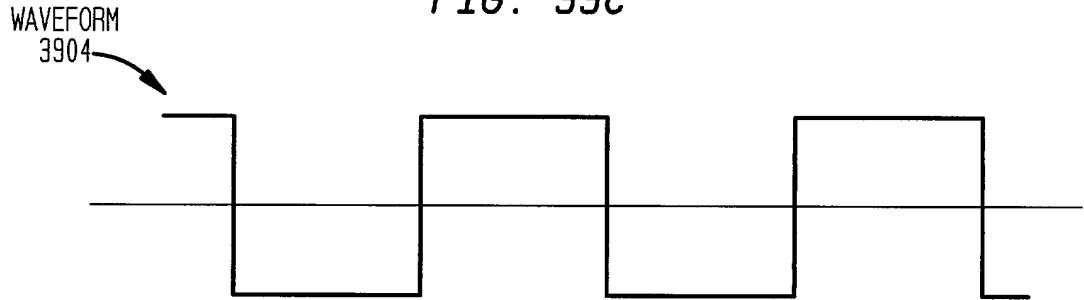
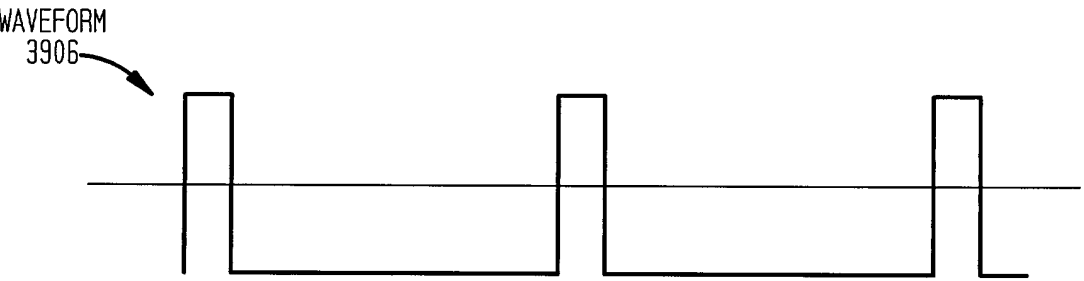


FIG. 39D



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FIG. 40A

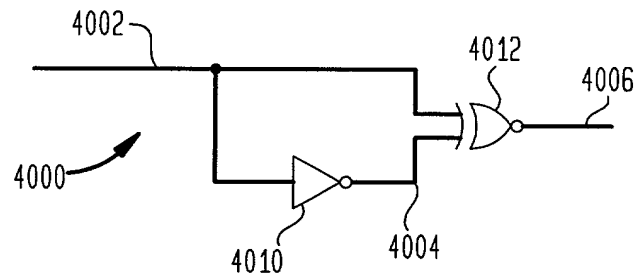


FIG. 40B

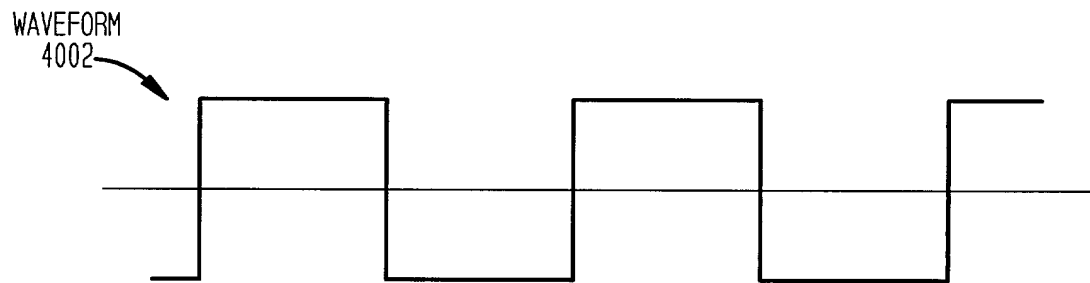


FIG. 40C

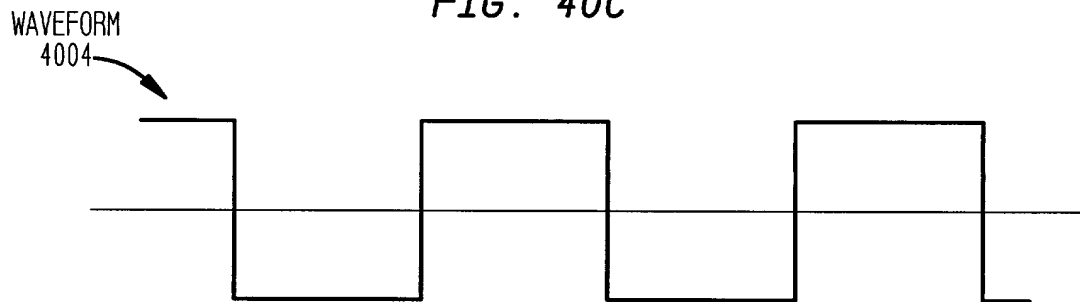
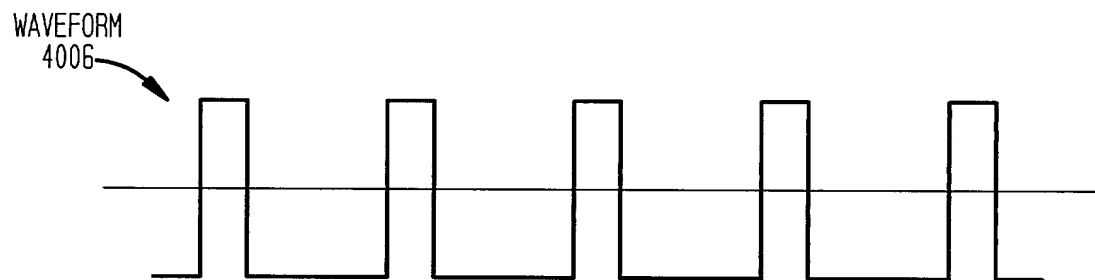


FIG. 40D



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FIG. 41

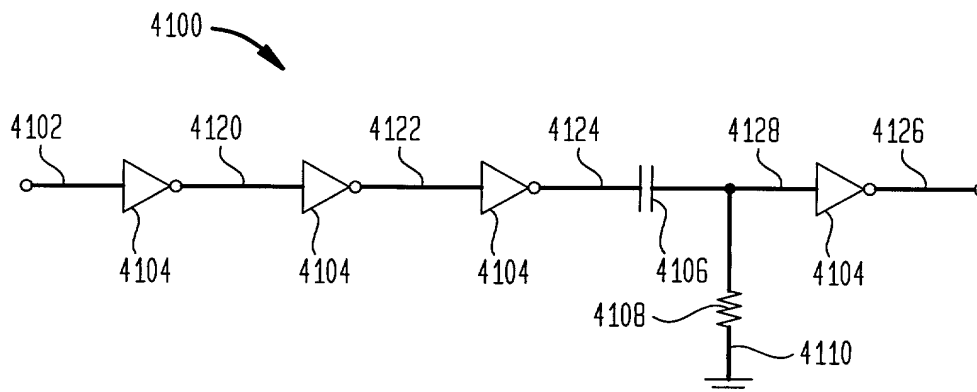


FIG. 42A

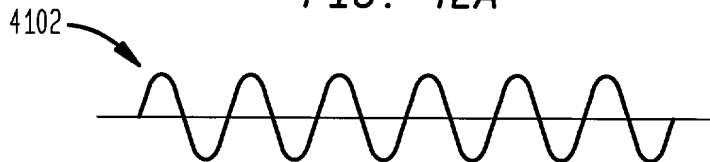


FIG. 42B

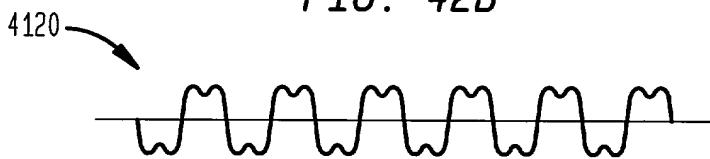


FIG. 42C

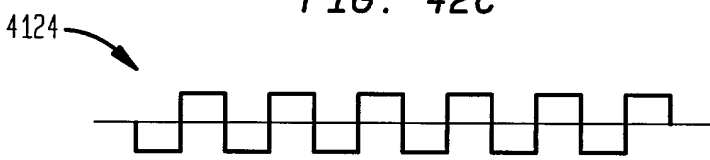


FIG. 42D

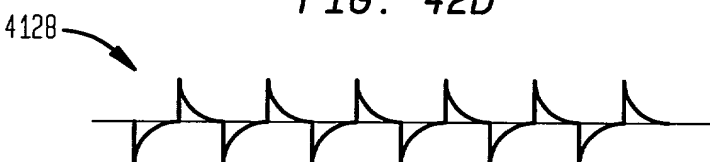
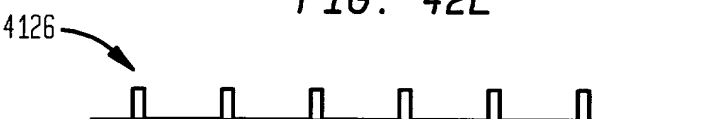
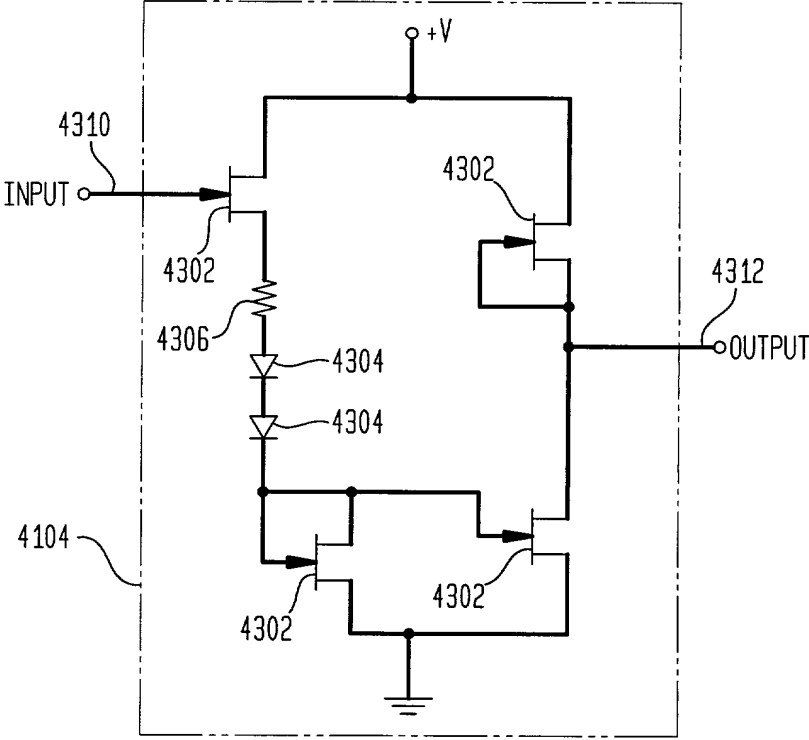


FIG. 42E



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FIG. 43

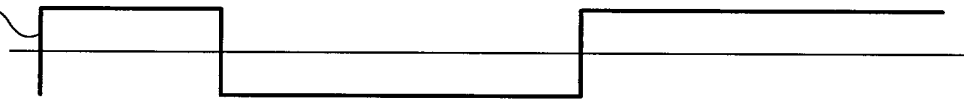


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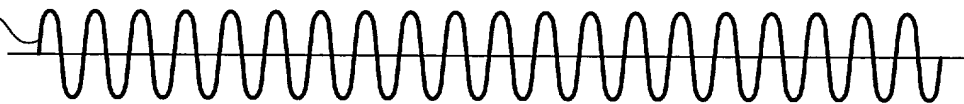
INFORMATION
SIGNAL
4402

FIG. 44A



CARRIER
SIGNAL
4404

FIG. 44B



PM SIGNAL
4406

FIG. 44C



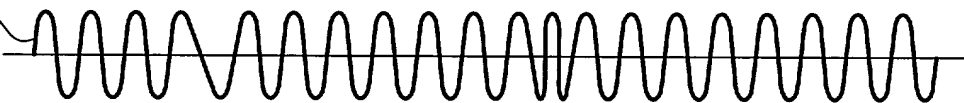
HARMONICALLY
RICH SIGNAL
4408

FIG. 44D



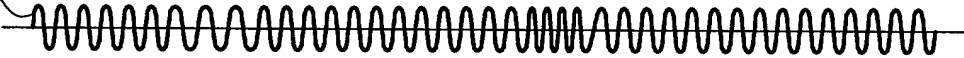
FUNDAMENTAL
HARMONIC
4410

FIG. 44E



SECOND
HARMONIC
4412

FIG. 44F

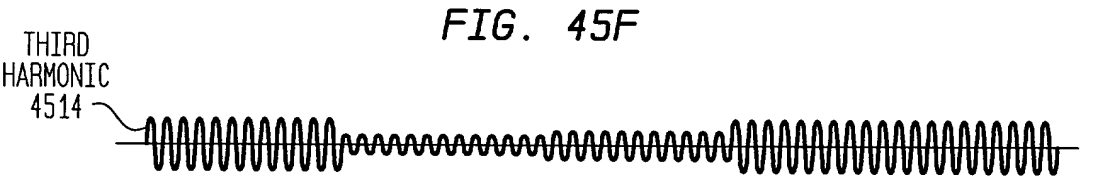
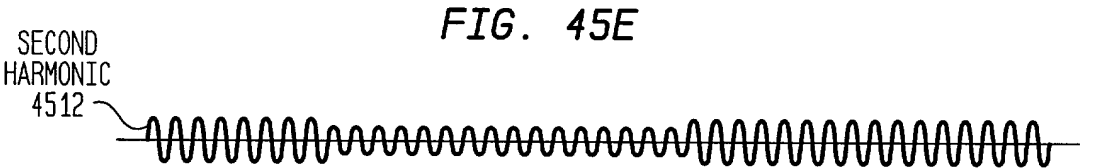
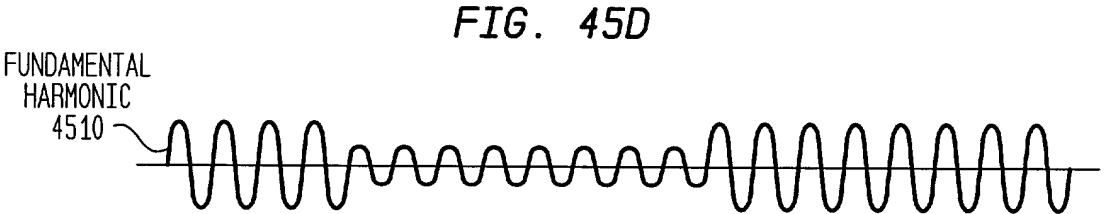
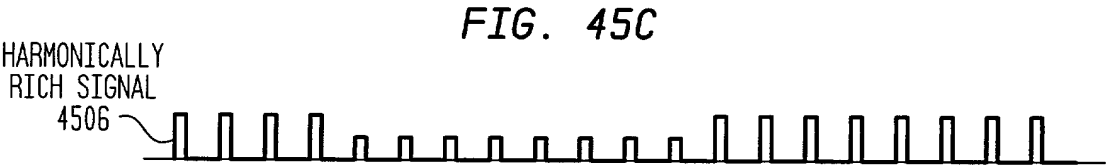
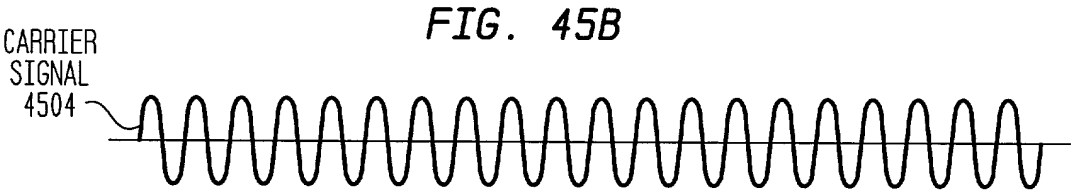
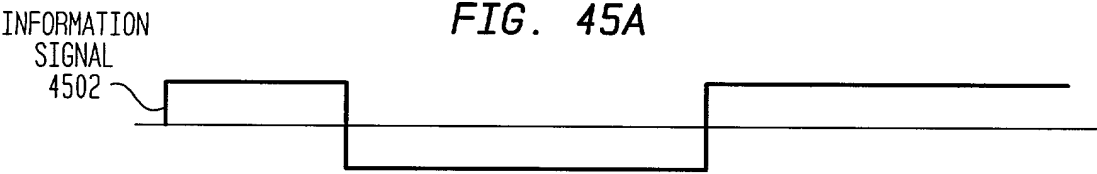


THIRD
HARMONIC
4414

FIG. 44G



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FIG. 46

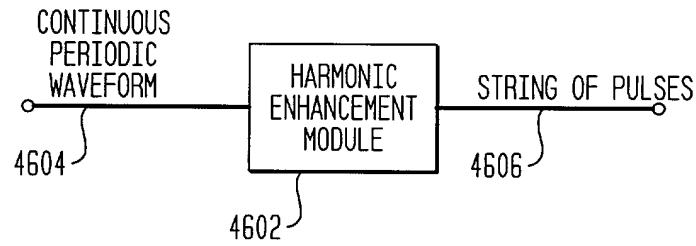
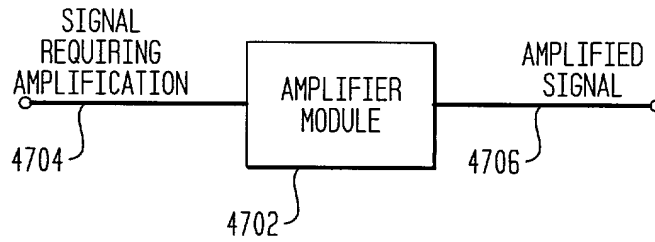
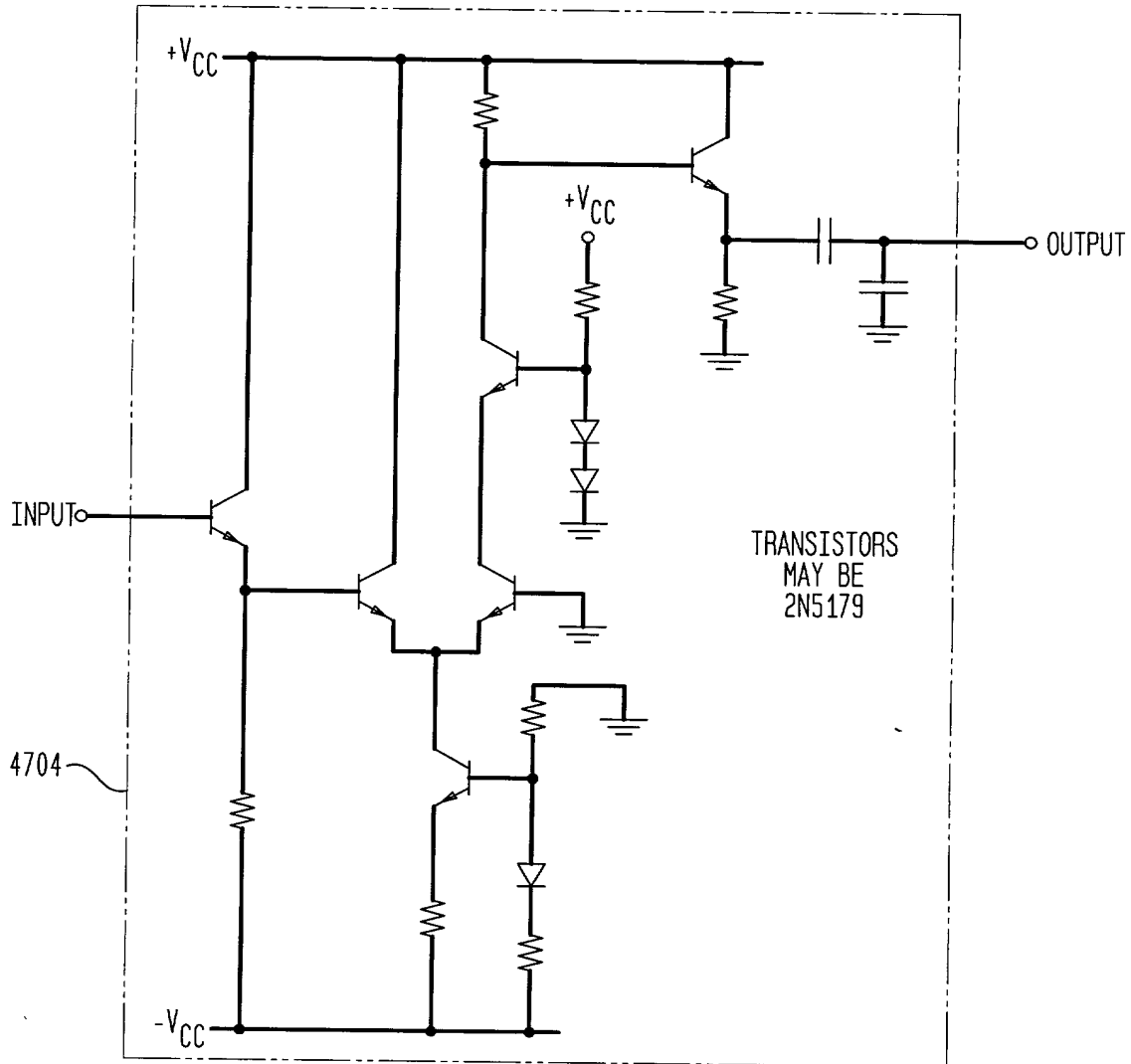


FIG. 47



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FIG. 48A



“PCT/US 01/00007”

FIG. 48B

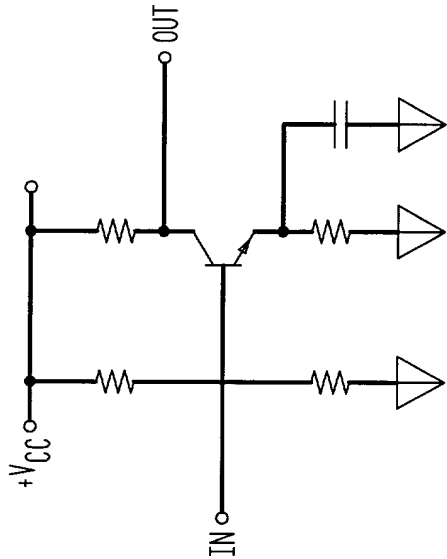
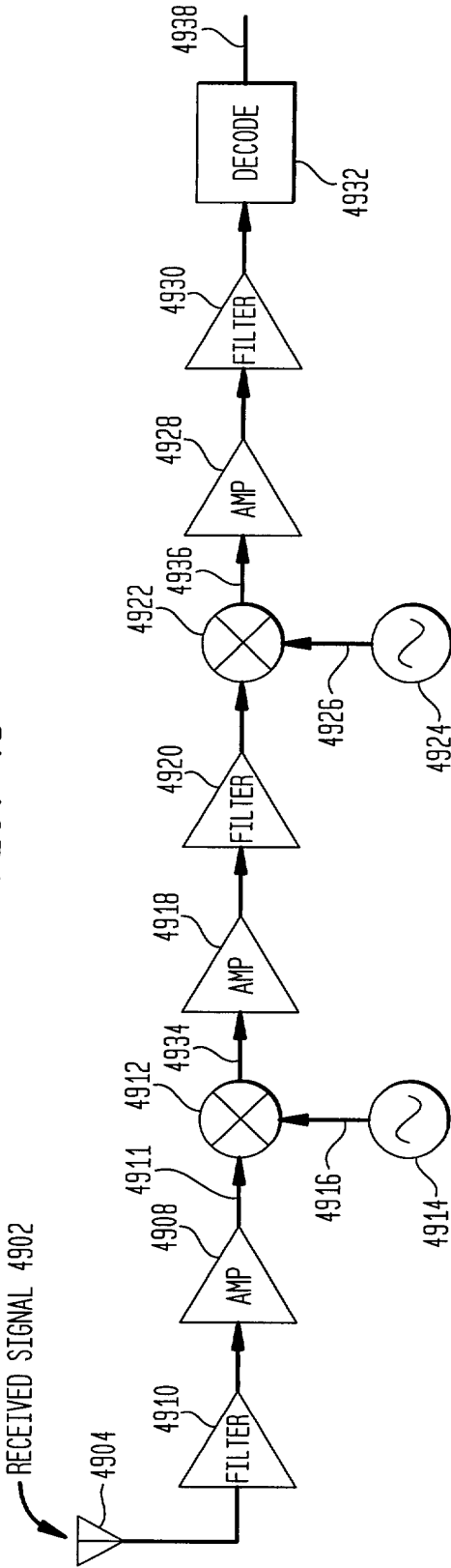
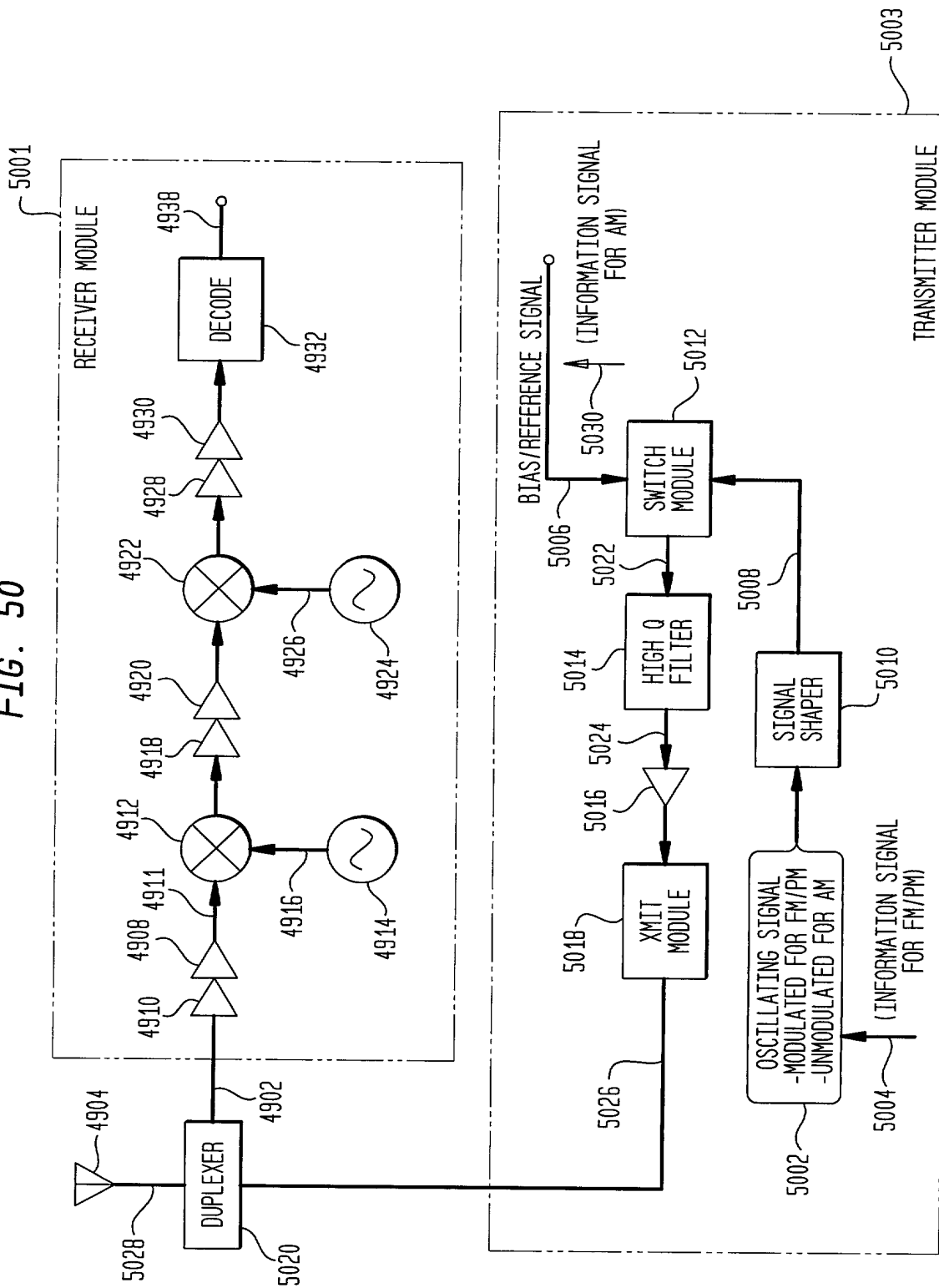


FIG. 49



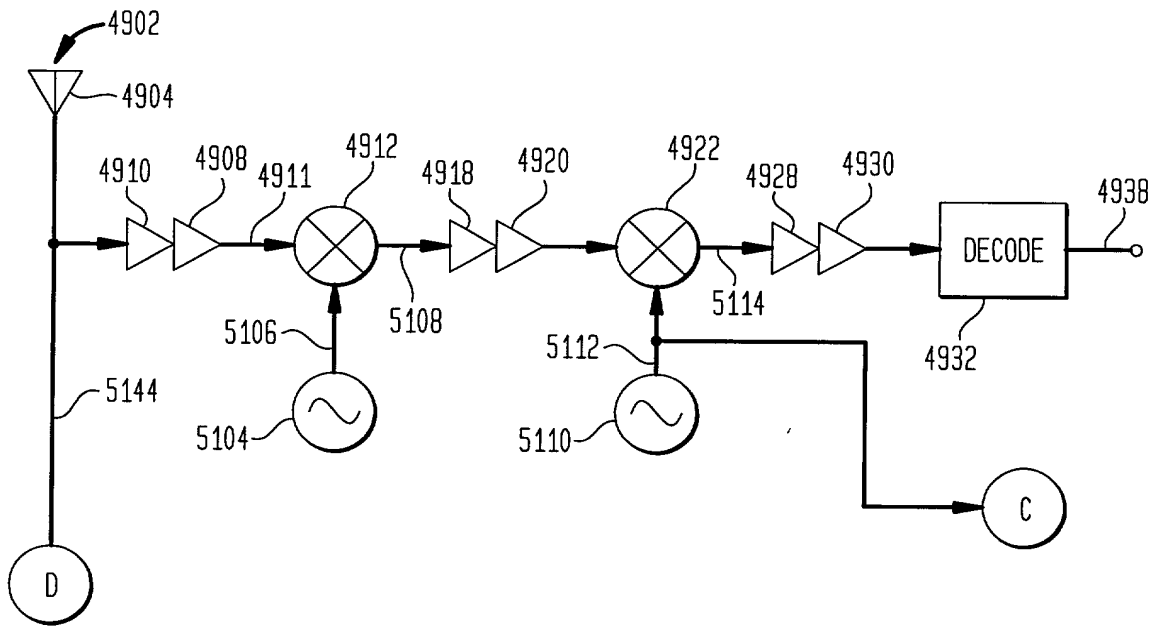
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FIG. 50



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FIG. 51A



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FIG. 51B

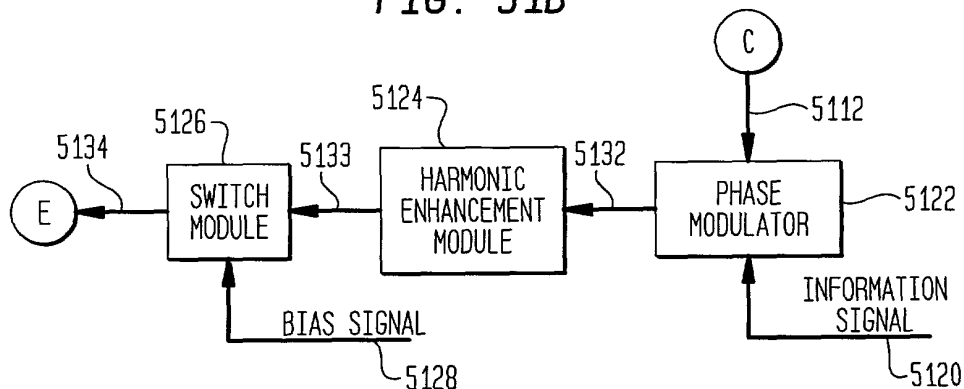


FIG. 51C

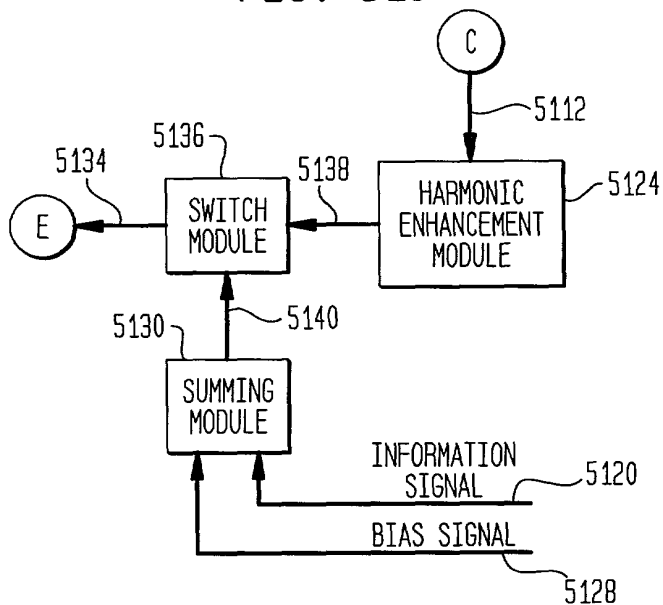
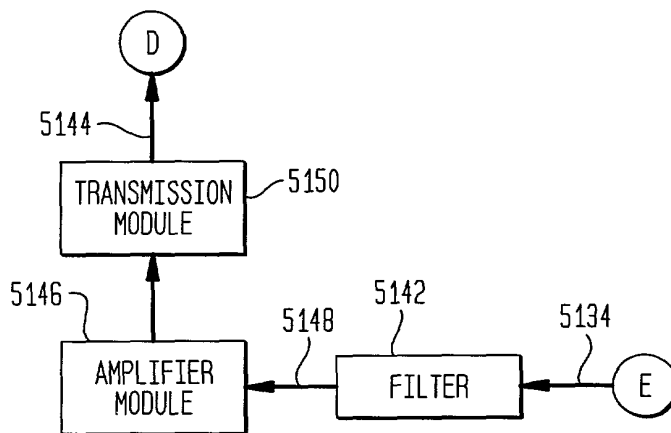


FIG. 51D

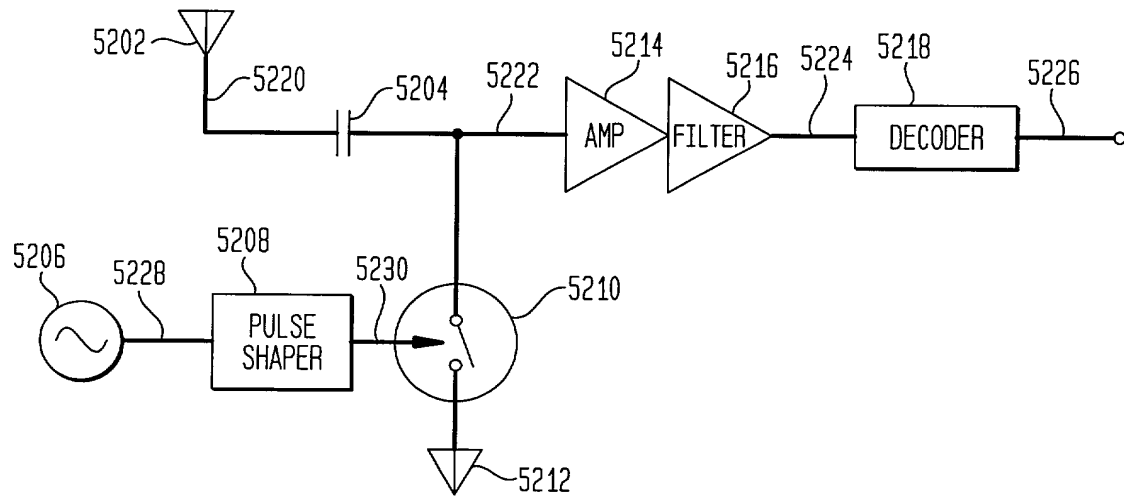


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FIG. 52

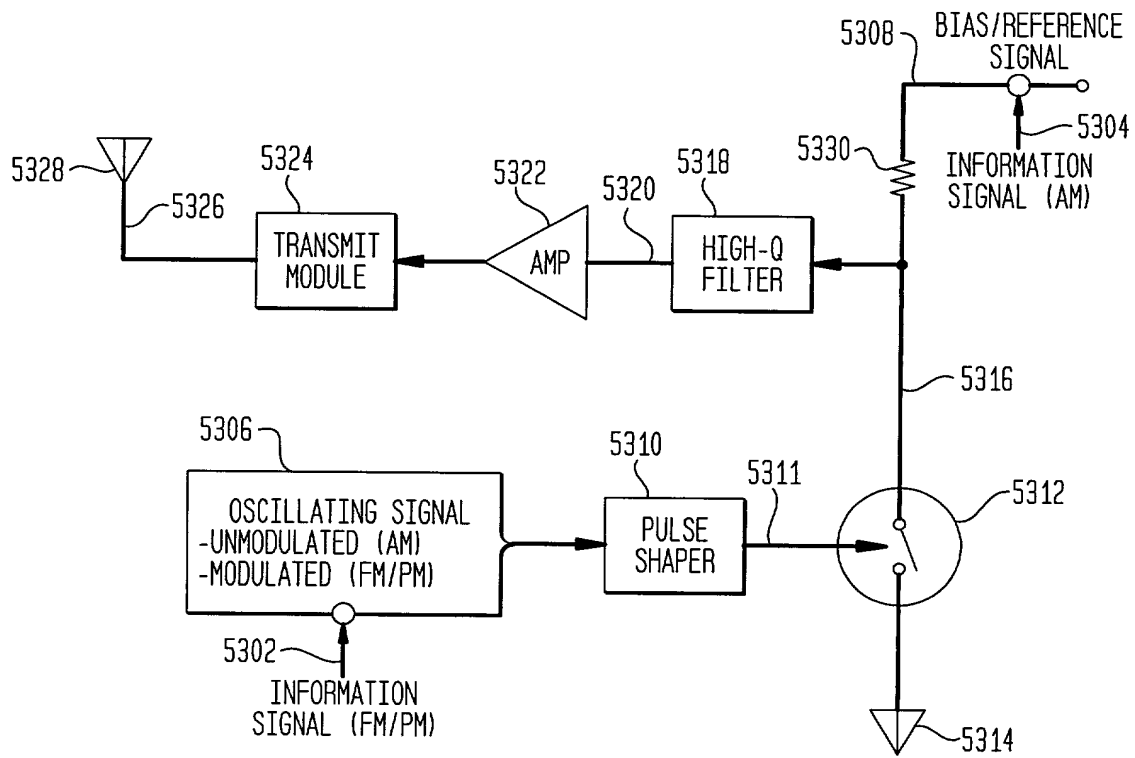
EXEMPLARY RECEIVER FOR
UNIVERSAL FREQUENCY DOWN-CONVERSION



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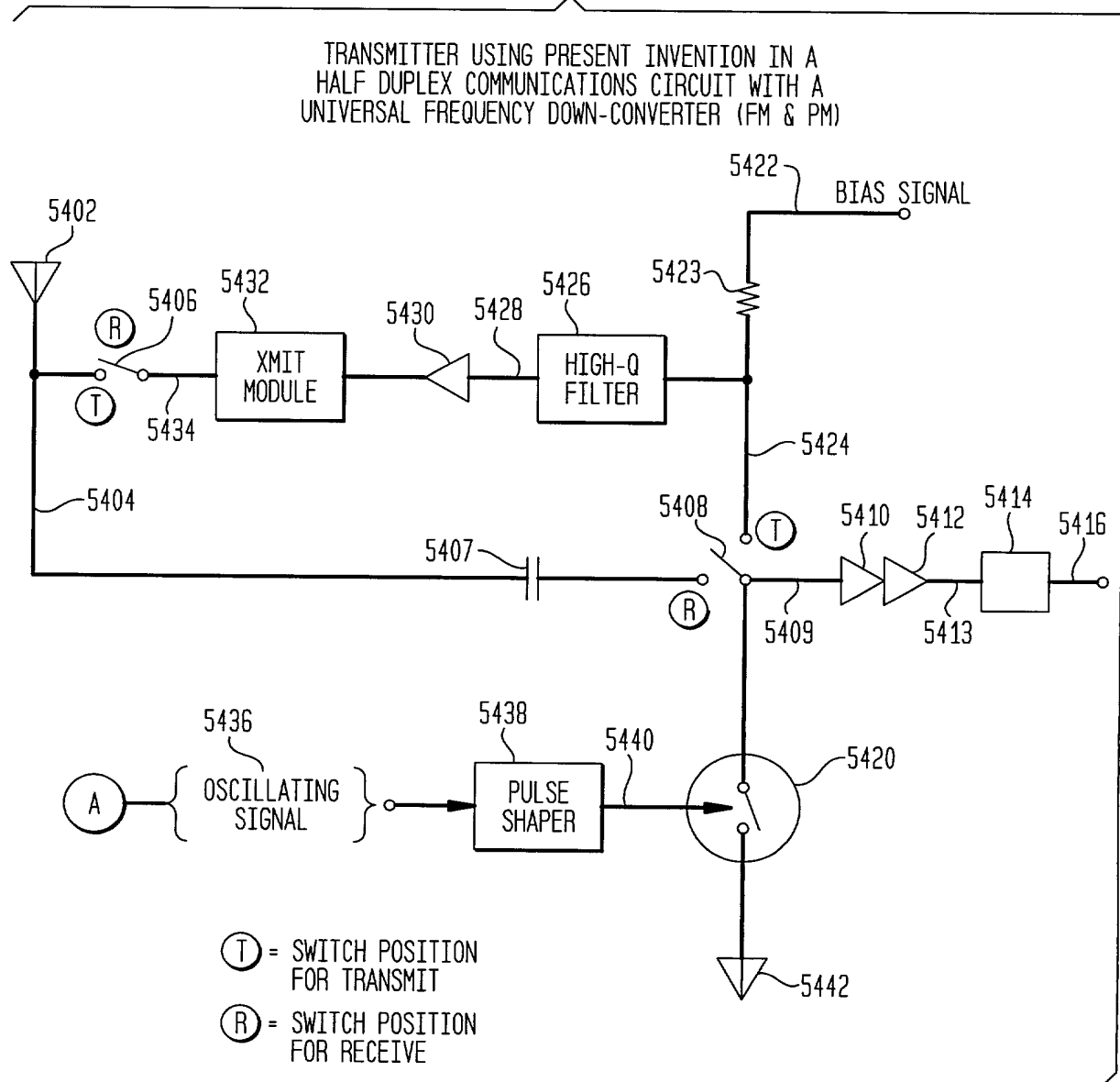
FIG. 53

EXEMPLARY TRANSMITTER USING
THE PRESENT INVENTION



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FIG. 54A



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FIG. 54B

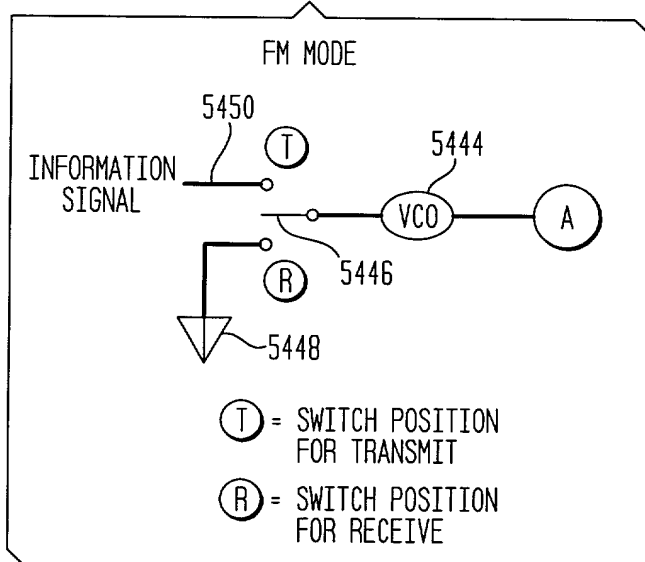
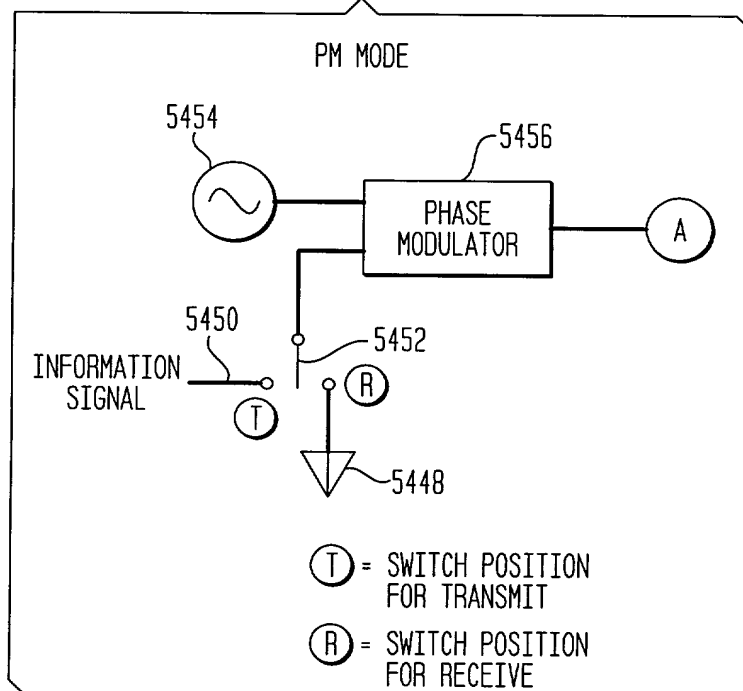


FIG. 54C

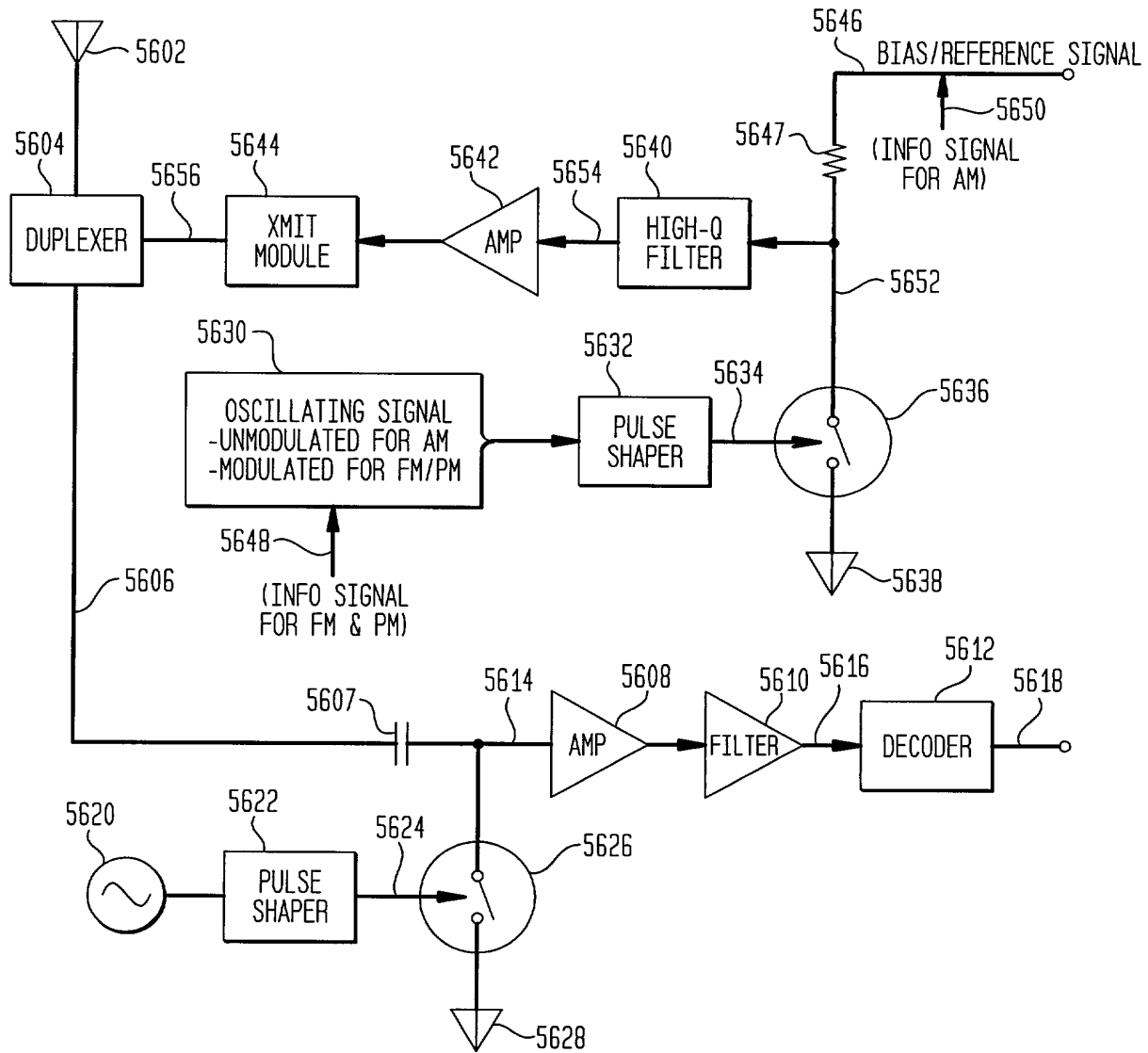


The diagram illustrates a radio receiver and transmitter circuit. At the top, an antenna (5402) is connected to a switch (5406) with positions 'R' (Receive) and 'T' (Transmit). The 'R' path leads through a circulator (5430) and a high-Q filter (5426) to a summing module (5504). The 'T' path leads through an XMIT module (5432) and a circulator (5430) to the same summing module. The summing module also receives a reference signal (5506) and a bias signal (5422). Its output (5450) is an info signal. The circuit also includes a pulse shaper (5438) driven by a pulse (5440) from a circulator (5420), which is connected to a switch (5408) with positions 'R' and 'T'. The 'R' path of this switch leads to a circulator (5410) and a filter (5414), while the 'T' path leads to a circulator (5412) and a filter (5416). A circulator (5423) is also shown, connecting the high-Q filter to the summing module and the pulse shaper to the circulator (5420).

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FIG. 56

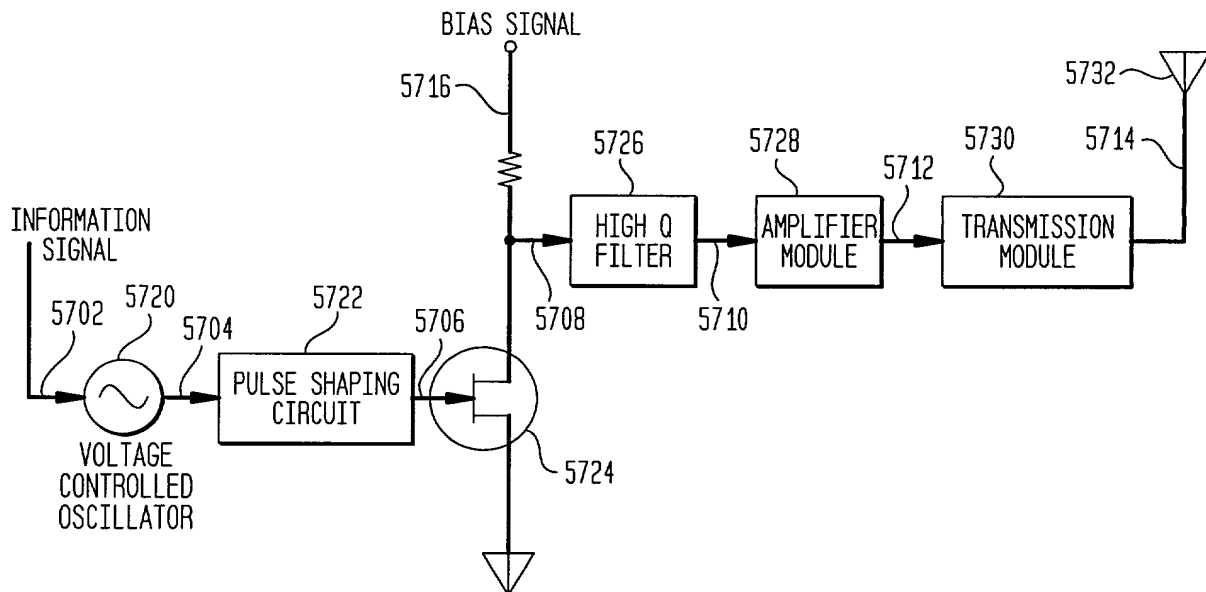
TRANSMITTER USING PRESENT INVENTION IN
FULL DUPLEX COMMUNICATIONS CIRCUIT WITH
UNIVERSAL FREQUENCY DOWN-CONVERTER



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FIG. 57A

TRANSMITTER IN THE FM EMBODIMENT



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FIG. 57B

TRANSMITTER IN THE PM EMBODIMENT

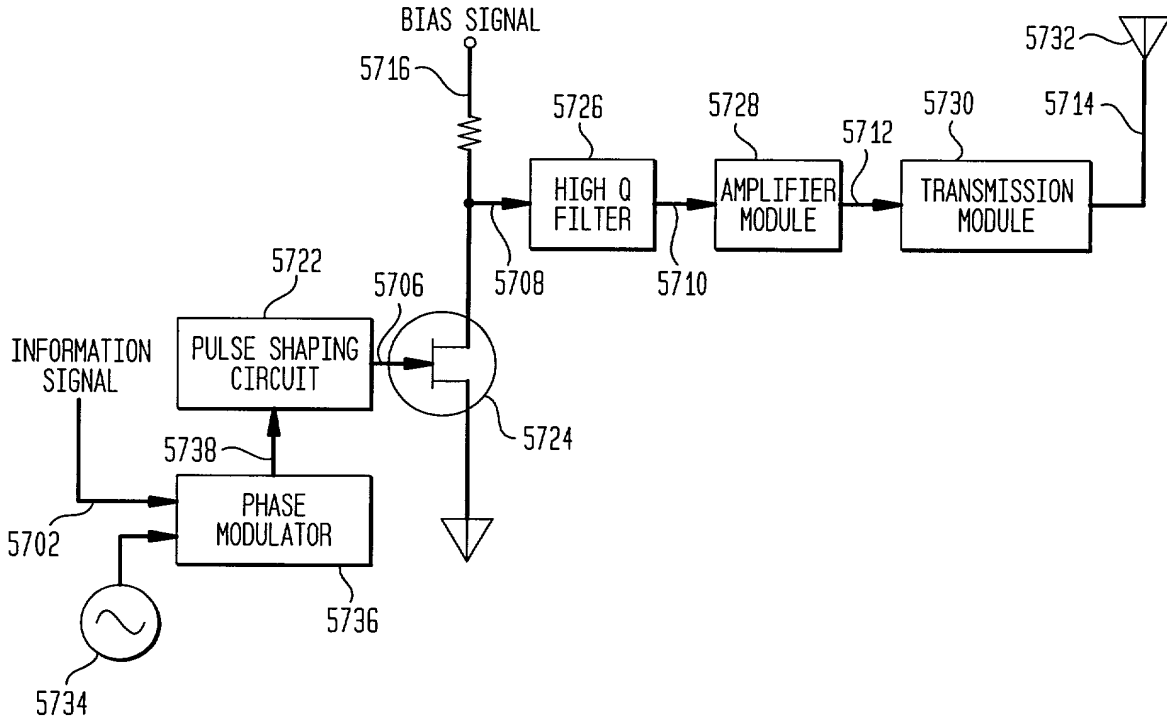
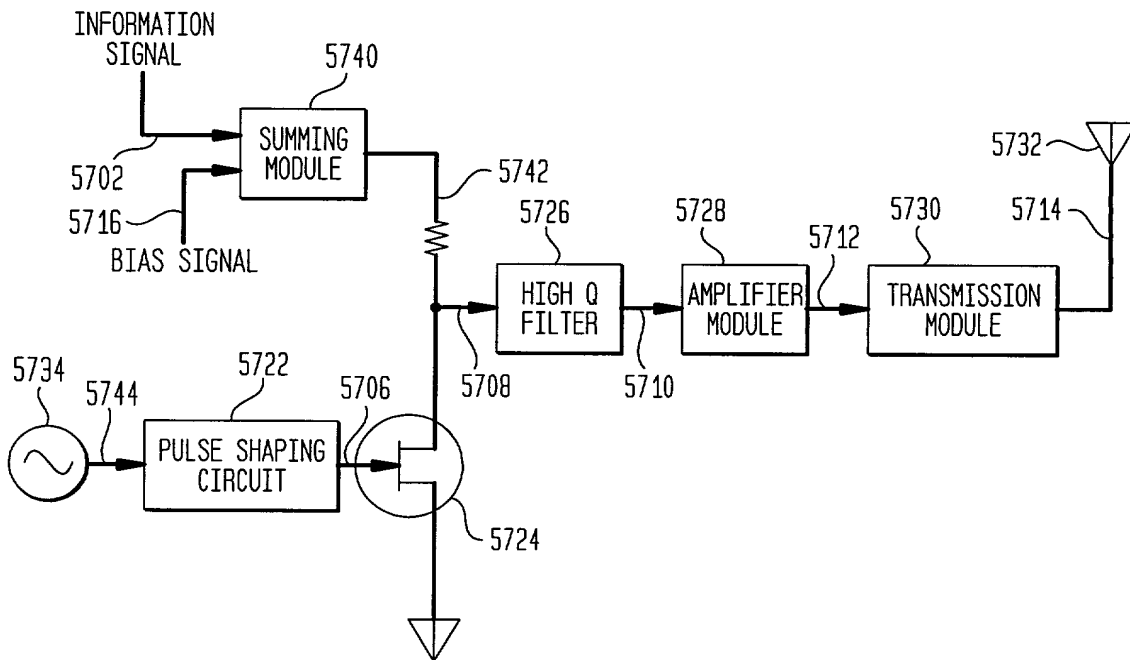


FIG. 57C

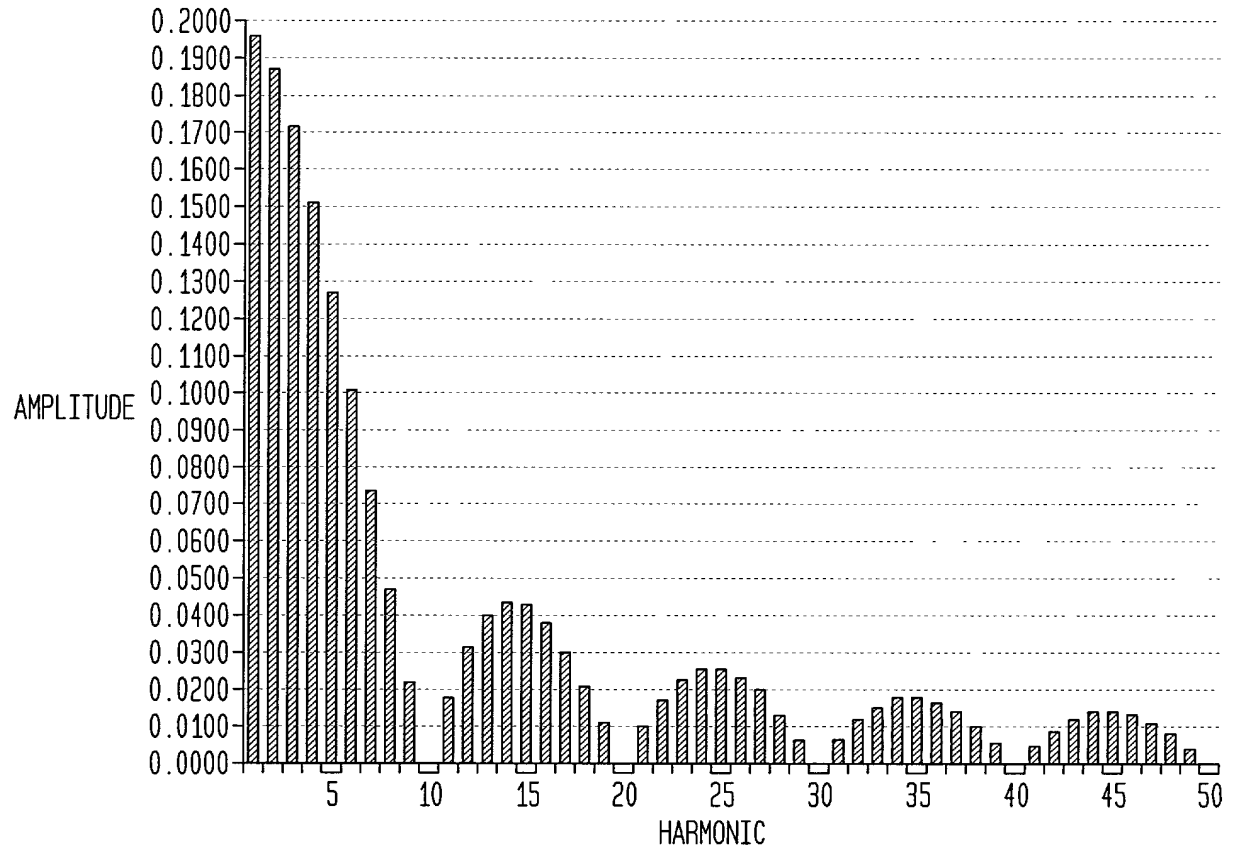
TRANSMITTER IN THE AM EMBODIMENT



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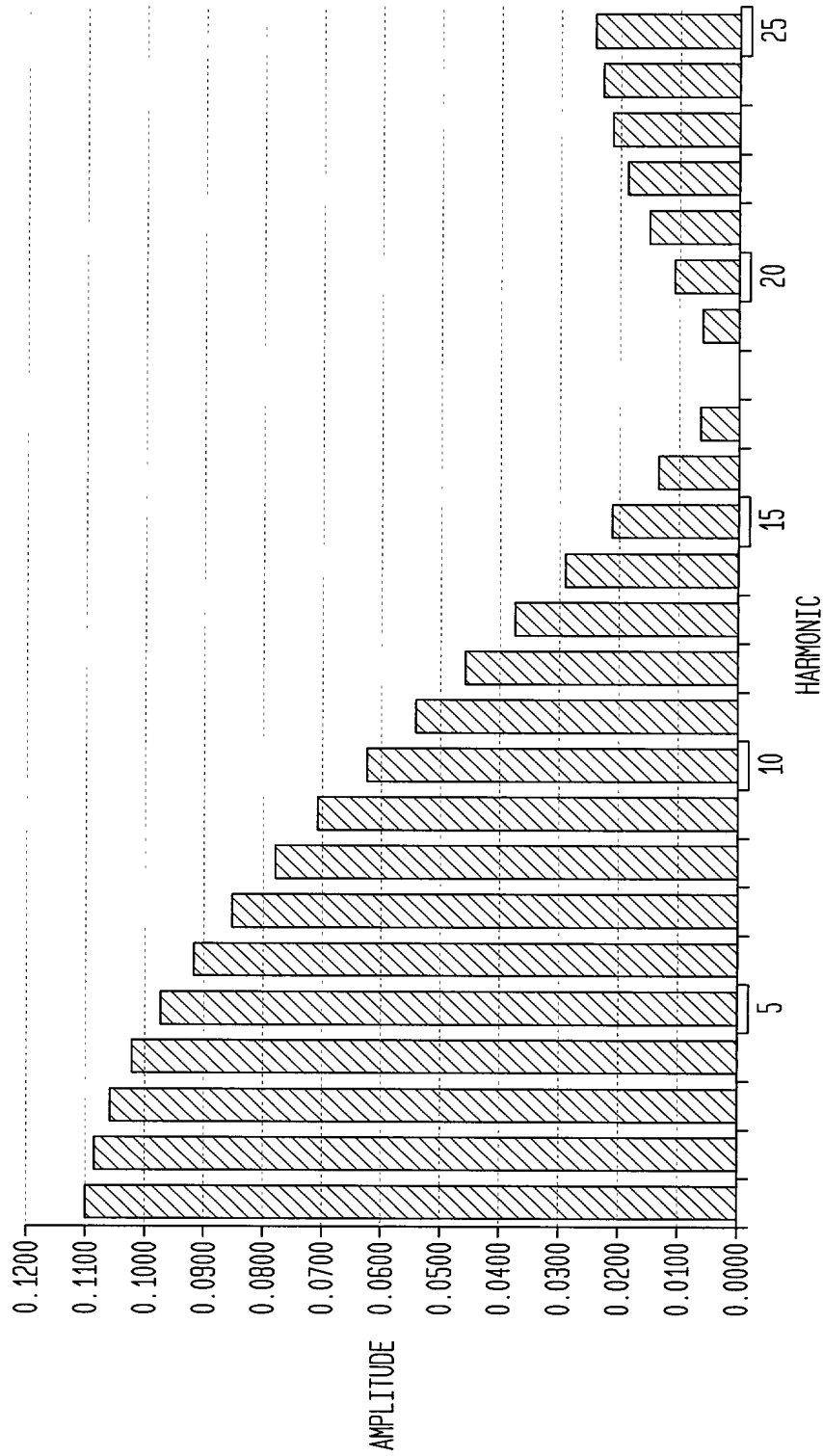
FIG. 58

PW/T RATIO = 0.1



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FIG. 59



PW/T = 0.0556 (9TH HARMONIC)

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FIG. 60

6000

	τ/T	=	0.500	0.250	0.100	0.050	0.010	0.005
HARMONIC								
1			0.6366	0.4502	0.1967	0.0996	0.0200	0.01000
2			0.00	0.3183	0.1871	0.0984	0.0200	0.01000
3			0.2122	0.1501	0.1717	0.0963	0.0200	0.01000
4			0.00	0.00	0.1514	0.0935	0.0199	0.00999
5			0.1273	0.0900	0.1273	0.0900	0.0199	0.00999
6			0.00	0.1061	0.1009	0.0858	0.0199	0.00999
7			0.0909	0.0643	0.0736	0.0810	0.0198	0.00998
8			0.00	0.00	0.0468	0.0757	0.0198	0.00997
9			0.0707	0.0500	0.0219	0.0699	0.0197	0.00997
10			0.00	0.0637	0.00	0.0637	0.0197	0.00996
11			0.0579	0.0409	0.0179	0.0572	0.0196	0.00995
12			0.00	0.00	0.0312	0.0505	0.0195	0.00994
13			0.0490	0.0346	0.0396	0.0436	0.0194	0.00993
14			0.00	0.0455	0.0432	0.0368	0.0194	0.00992
15			0.0424	0.0300	0.0424	0.0300	0.0193	0.00991
16			0.00	0.00	0.0378	0.0234	0.0192	0.00990
17			0.0374	0.0265	0.0303	0.0170	0.0191	0.00988
18			0.00	0.0354	0.0208	0.0109	0.0190	0.00987
19			0.0335	0.0237	0.0104	0.0052	0.0188	0.00985
20			0.00	0.00	0.00	0.00	0.0187	0.00984
21			0.0303	0.0214	0.0094	0.0047	0.0186	0.00982
22			0.00	0.0289	0.0170	0.0089	0.0184	0.00980
23			0.0277	0.0196	0.0224	0.0126	0.0183	0.00978
24			0.00	0.00	0.0252	0.0156	0.0182	0.00976
25			0.0255	0.0180	0.0255	0.0180	0.0180	0.00974
26			0.00	0.0245	0.0233	0.0198	0.0178	0.00972
27			0.0236	0.0167	0.0191	0.0210	0.0177	0.00970
28			0.00	0.00	0.0134	0.0216	0.0175	0.00968
29			0.0220	0.0155	0.0068	0.0217	0.0173	0.00966
30			0.00	0.0212	0.00	0.0212	0.0172	0.00963
31			0.0205	0.0145	0.0063	0.0203	0.0170	0.00961
32			0.00	0.00	0.0117	0.0189	0.0168	0.00958
33			0.0193	0.0136	0.0156	0.0172	0.0166	0.00956
34			0.00	0.0187	0.0178	0.0151	0.0164	0.00953
35			0.0182	0.0129	0.0182	0.0129	0.0162	0.00950
36			0.00	0.00	0.0168	0.0104	0.0160	0.00948
37			0.0172	0.0122	0.0139	0.0078	0.0158	0.00945
38			0.00	0.0168	0.0098	0.0052	0.0156	0.00942
39			0.0163	0.0115	0.0050	0.0026	0.0154	0.00939
40			0.00	0.00	0.00	0.00	0.0151	0.00935
41			0.0155	0.0110	0.0048	0.0024	0.0149	0.00932
42			0.00	0.0152	0.0089	0.0047	0.0147	0.00929
43			0.0148	0.0105	0.0120	0.0067	0.0144	0.00926
44			0.00	0.00	0.0138	0.0085	0.0142	0.00922
45			0.0141	0.0100	0.0141	0.0100	0.0140	0.00919
46			0.00	0.0138	0.0132	0.0112	0.0137	0.00915
47			0.0135	0.0096	0.0110	0.0121	0.0135	0.00912
48			0.00	0.00	0.0078	0.0126	0.0132	0.00908
49			0.0130	0.0092	0.0040	0.0128	0.0130	0.00904
50			0.00	0.0127	0.00	0.0127	0.0127	0.00900

FIG. 60" 6000"

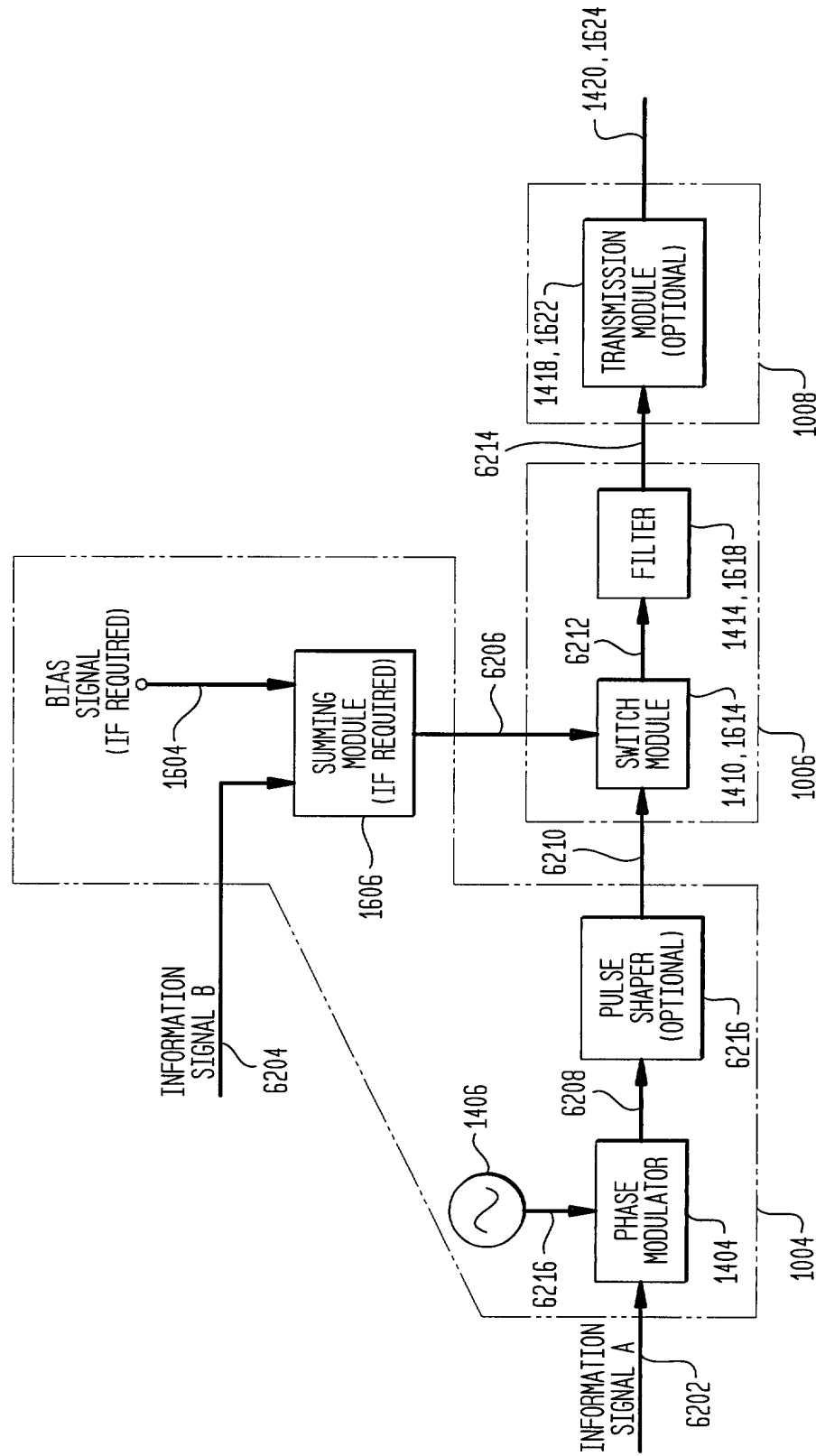
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FIG. 61

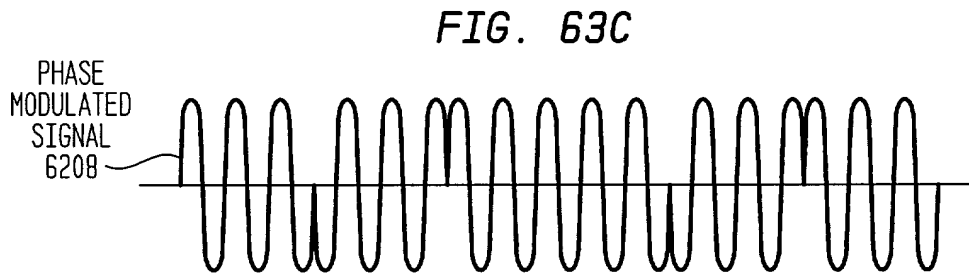
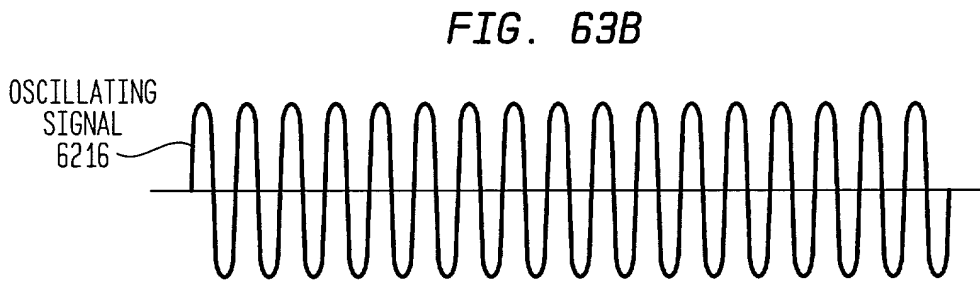
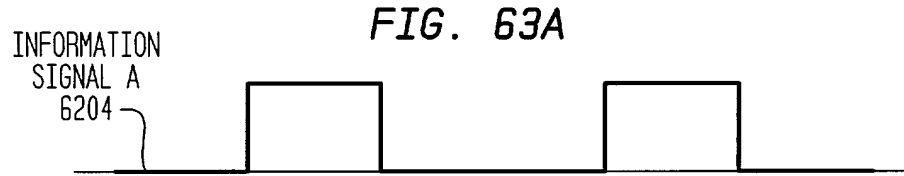
6100

HARMONIC	τ/I	=	0.5000	0.2500	0.1667	0.1250	0.1000	0.0833	0.0714	0.0625	0.0556	0.0500
1			1	2	3	4	5	6	7	8	9	10
2			0.6366	0.4502	0.3183	0.2436	0.1967	0.1648	0.1417	0.1242	0.1105	0.0996
3			0.0000	0.3183	0.2757	0.2251	0.1871	0.1592	0.1381	0.1218	0.1089	0.0984
4			0.2122	0.1501	0.2122	0.1961	0.1717	0.1501	0.1323	0.1179	0.1061	0.0963
5			0.0000	0.0000	0.1378	0.1592	0.1514	0.1378	0.1244	0.1125	0.1023	0.0935
6			0.1273	0.0900	0.0637	0.1176	0.1273	0.1230	0.1147	0.1059	0.0975	0.0900
7			0.0000	0.1061	0.0000	0.0750	0.1009	0.1061	0.1034	0.0980	0.0919	0.0858
8			0.0909	0.0643	0.0455	0.0348	0.0736	0.0878	0.0909	0.0892	0.0855	0.0810
9			0.0000	0.0000	0.0689	0.0000	0.0468	0.0689	0.0776	0.0796	0.0784	0.0757
10			0.0707	0.0500	0.0707	0.0271	0.0219	0.0500	0.0637	0.0694	0.0707	0.0699
11			0.0000	0.0637	0.0551	0.0450	0.0000	0.0318	0.0498	0.0588	0.0627	0.0637
12			0.0579	0.0409	0.0289	0.0535	0.0179	0.0150	0.0361	0.0481	0.0544	0.0572
13			0.0000	0.0000	0.0000	0.0531	0.0312	0.0000	0.0230	0.0375	0.0459	0.0505
14			0.0490	0.0346	0.0245	0.0452	0.0336	0.0127	0.0109	0.0272	0.0375	0.0436
15			0.0000	0.0455	0.0394	0.0322	0.0432	0.0227	0.0000	0.0174	0.0292	0.0368
16			0.0424	0.0300	0.0424	0.0162	0.0424	0.0300	0.0094	0.0083	0.0212	0.0300
17			0.0000	0.0000	0.0345	0.0000	0.0378	0.0345	0.0173	0.0000	0.0136	0.0234
18			0.0374	0.0265	0.0187	0.0143	0.0303	0.0362	0.0233	0.0073	0.0065	0.0170
19			0.0000	0.0354	0.0000	0.0250	0.0208	0.0354	0.0277	0.0135	0.0000	0.0109
20			0.0335	0.0237	0.0168	0.0310	0.0104	0.0324	0.0302	0.0186	0.0058	0.0052
21			0.0000	0.0000	0.0276	0.0318	0.0000	0.0276	0.0310	0.0225	0.0109	0.0000
22			0.0303	0.0214	0.0303	0.0280	0.0094	0.0214	0.0303	0.0252	0.0152	0.0047
23			0.0000	0.0289	0.0251	0.0205	0.0170	0.0145	0.0282	0.0267	0.0186	0.0089
24			0.0277	0.0196	0.0138	0.0106	0.0224	0.0072	0.0249	0.0271	0.0212	0.0126
25			0.0000	0.0000	0.0000	0.0000	0.0252	0.0000	0.0207	0.0265	0.0230	0.0156
25			0.0255	0.0180	0.0127	0.0097	0.0255	0.0066	0.0159	0.0250	0.0239	0.0180

FIG. 62



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FIG. 63E

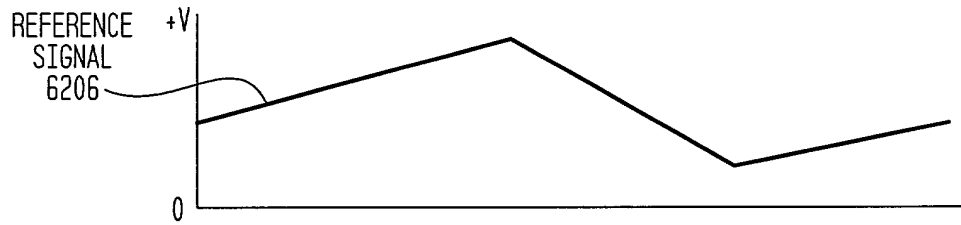


FIG. 63F

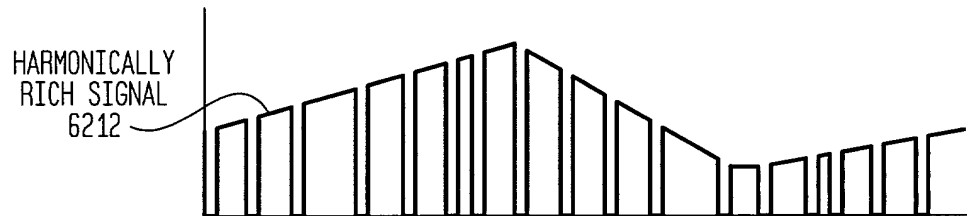


FIG. 63G

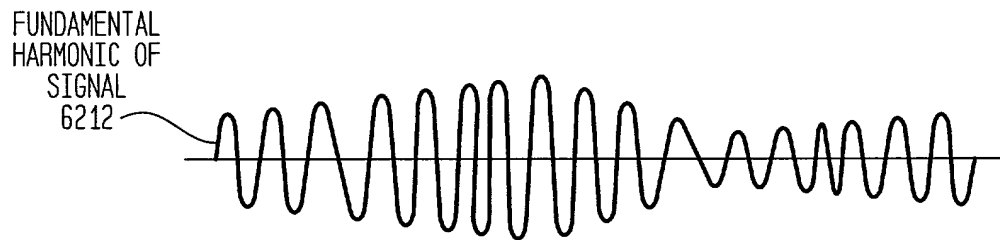
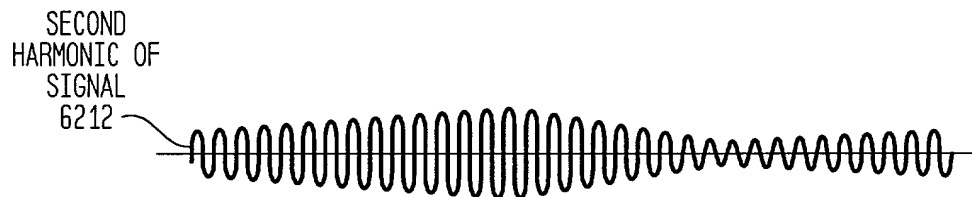


FIG. 63H



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FIG. 64A

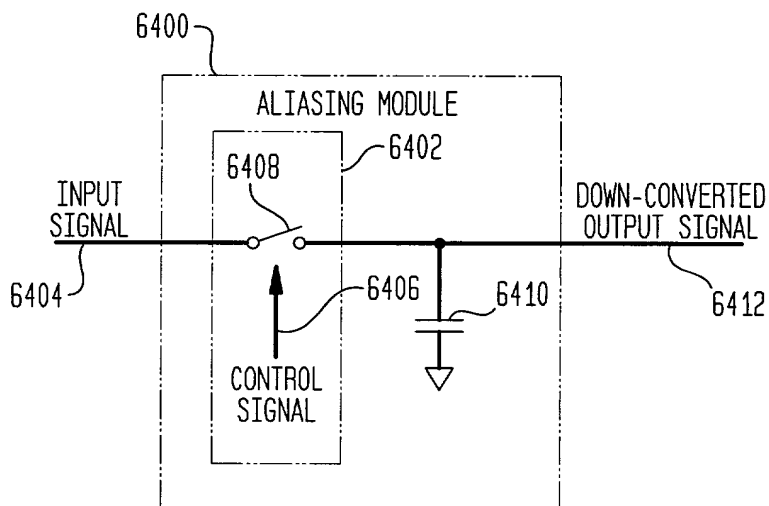
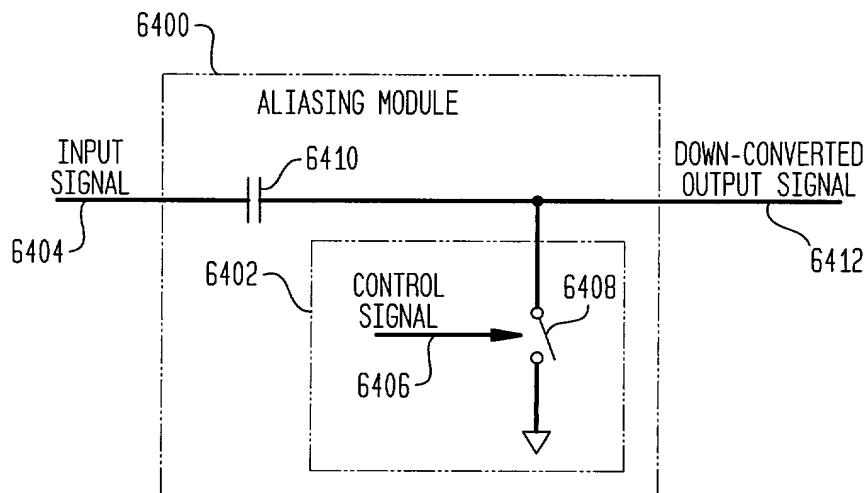


FIG. 64A-1



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FIG. 64B

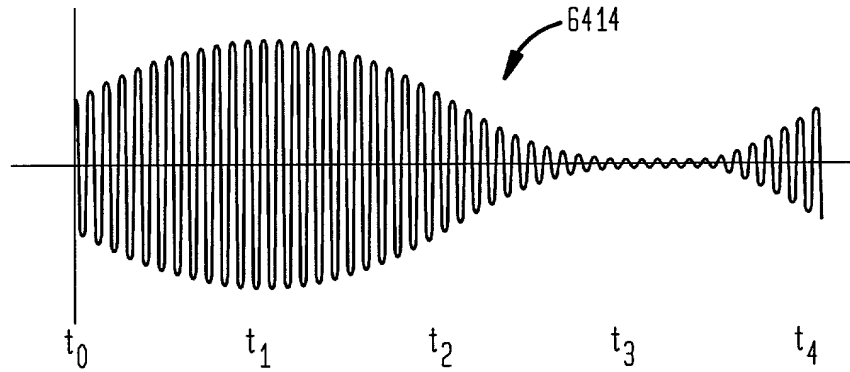


FIG. 64C

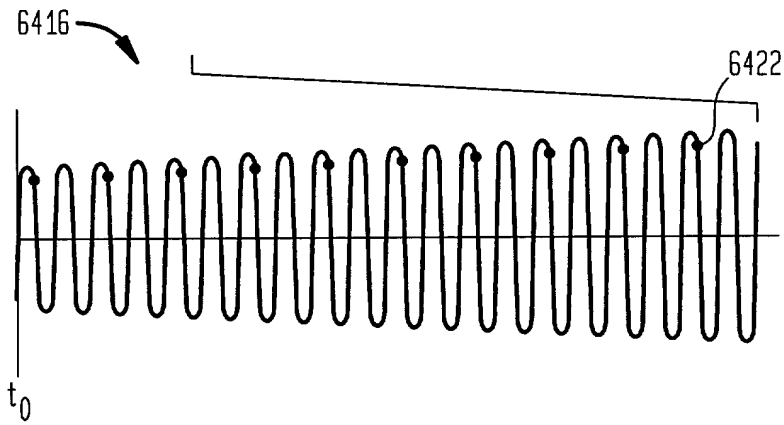


FIG. 64D



FIG. 64E

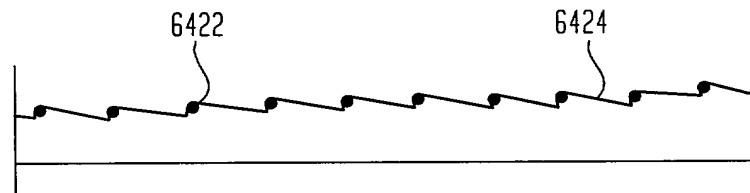


FIG. 64F

